PRACTICAL HI-FI

JULY 1980
50p
AUSTRALIA $1.80
NEW ZEALAND $1.90
MALAYSIA $4.50

LOUDSPEAKERS – some straight talking

TOP TUNERS ON TEST -JVC's T40P and Trio's KT815

AIWA'S AD6700 CASSETTE DECK IS ON ITS METAL!

SECRETS OF THE RECORDING STUDIOS -three special features

Music is a subjective and qualitative art-form. High fidelity's reason for existence is the reproduction of music. And the confused and controversial state of this industry stems largely from the paradox of attempts to evaluate the subjective quality of reproduced music by objective and quantitative criteria. Mission Series II product line takes it for granted that quantitative parameters and specifications are well taken care of. Our intention is to move the field forward in the realm of many unknowns in the reproduction of living sound. Rather than engaging in pedestrian discussions of frequency response, watts, volts, distortion, coloration, currents, etc., or offering gadgetry, novelty and gimmickry, we are endeavouring to put feeling, coherence and drama back into reproduced music.

Perception of emotions in music is a vital constituent of "quality" in the reproduction of the art-form. The trouble is, no measurement equipment can, as yet, quantify such a parameter and, indeed, many more besides! Even if we accept the engineers' dictum that in many areas of Man's technical endeavours, objective and quantitative criteria are indicators of "quality", Mission contend that in our field such measures need not necessarily correlate with the subjective preception.

Here, we believe that until the "state-of-research" in materials science, electronics, acoustics, auditory perception, etc., is further developed, qualitative criteia must be introduced. Especially, as we are involved in the intricate interplay of science and art! The ultimate judgement is your perception of how close we get to reproducing live music.

coupon to:— MISSION ELECTRONICS LTD.,
Unit 9A, George Street, Huntingdon,
Cambs. PE18 6BD.
Telephone: 0480 57151

Name ....

Address ....

PRACTICAL HI-FI

volume 8 number 93
JULY 1980

contents

NEWS 5
Read all about it! Newshound Riches has been doing the rounds again and comes up with some more goodies

SOUND US OUT 19
Readers voice their comments about the hi-fi scene

AUDIOCLINIC 26
Our team of experts give their advice and views on a range of problems associated with hi-fi equipment

THINGS WE HEAR 35
Our Editor's been at the bottle again but this time he's writing about valve 'bottles' and the fun he's had with bits of solder and connecting leads

AUDIOLAB SPECIAL 36
A special Audiolab report on the **Trio 815** pulse-counting tuner, **JVC T40P** tuner, **Audio-Pro TPA 150** receiver/**A4-14** speakers and the **Aiwa AD6700 Mk2** cassette deck

WHAT'S HAPPENING IN A RECORDING STUDIO 49
Carl Anthony has been lurking again — this time in a recording studio — and he describes the different sound effects that can be obtained by using electronics

THE MAKING OF MAGNUS RECORDS 52
Carl Anthony talks about the true sound of recordings. Do we like the raw material or prefer to have it 'doctored' to sound how we think it should sound?

LOOKING IN ON ECM 55
He's at it again! Carl Anthony talks about Edition for Contemporary Music

SOUNDS IN SHORT 56
Geoff Giles writes some more of his famed mini-reviews. This month he looks at the **Marantz PM250** amplifier, **Nagaoka MP50** cartridge, **Denon DP-30L** turntable and **Akai GX-M10** cassette deck

AUDIOPHILE SUPPLEMENT 58
Brian Dance writes about tone controls and equalization while Dave Berriman reveals all with Trio's latest technology and Gordon King talks about his SI units

PRACTICAL HI-FI SOUND 66
Another chance to get your special offer of book and record

STRAIGHT TALKING — LOUDSPEAKERS 68
Bob Angus tells how *they* can make you buy the speakers *they* want and comments on '*why it has to be big to sound good*'

EAR TO THE GROUND 72
Dave Berriman expounds on esoteric hi-fi in the USA

HIGH PERFORMANCE CASSETTE RECORDER DESIGN 74
Basil Lane delves into the whys and wherefores of cassette deck design and theory

ANGUS ON AMERICA 79
Bob Angus, our newshound from across the pond tells us all

HOPE ON HI-FI 80
Hopes are high again for Adrian's low-down on the hi-fi scene

PRACTICAL HI-FI RECORD AND TAPE GUIDE 85
Our reviewers give their musical and technical verdicts on recent classical releases

THE MUSIC PAGE 90
Dave Berriman and Arthur Ord-Hume get together to talk about recordings and hovering organs — read on . . .

AUDIO GRAFFITI 93
It's that Carl Anthony again and this time he's put down his pen and taken up the aerosol can — read the writing on the wall

WE'RE SORRY BUT . . .

. . . industrial disputes have prevented us from including many of the features which we originally hoped to bring you in this issue. However, we are able to offer our usual quota of editorial content — reviews and features which we hope will prove adequate substitutes. Hopefully, normal working will be resumed by the August issue next month and we shall be able to bring you all the articles you have missed in this issue. Once again, our apologies to those of you disappointed by the absence of any particular feature.

HI-FI TEAM 80's

BARTLETTS

HI-FI & VIDEO CENTRE

New Sony C7 Video now in Stock

175 HOLLOWAY RD
LONDON N7 8JB
TELEPHONE: 01-607 2296
Open: 9.30-5.30 Mon-Sat (9.30-2 Thurs)

Agents for: ADC, Akai, Armstrong, Ariston, Aiwa, B & W, Bose, Celef, Castle, Edwardus, JBL, JVC, KEF, Keesonic, Mordaunt-Short, Monitor Audio, Pioneer, Panasonic, Sony, Studiocraft, Superscope, J.E. Sugden, Sanyo, Technics, Teac, Thorens, Ultracraft.

ERRICKS OF BRADFORD

FOTOSONIC HOUSE, RAWSON SQUARE,
BRADFORD, YORKSHIRE
TEL: (0274) 22972/31648
Open: 9.30-5.30 Mon-Sat

New Sony C7 Video now in Stock

ALSO AT: 2 WESTGATE, SHIPLEY (0274) 581597

Agents for: ADC, Aurex, A & R Cambridge, Ariston, Aiwa, Akai, Bose, B & W, Black Tulip, Black Widow, Castle, Denon, Edwardus, Ferrograph, Grace, Heybrook, ITT, JBL, KEF, Linn Sondek, Meridian, Mordaunt-Short, Neal, Panasonic, Pioneer, Quad, Revox, Rogers, Sony, J.E. Sugden, Scott, Sansui, Studiocraft, Spendor, Technics, Tascam, Tangent, Thorens, Uher, Ultracraft, Videtone. TOP-TAPE MAIL ORDER

ANALOG AUDIO

849 HIGH ROAD
N. FINCHLEY, LONDON N12
TELEPHONE: 01-445 1443
Open: 9.30-5.30 Mon-Sat (Fri 9.30-7 p.m.)

ALSO AT: 127 WILTON ROAD, SW1. 01-834 1430

Agents for: ADC, Audiomaster, Akai, Ariston, Aiwa, B & W, Bose, Castle, Dual, Edwardus, Ferrograph, ITT, JVC, JBL, KEF, Lux, Marantz, Micro-Seiki, Neal, Onkyo, Pioneer, Panasonic, Revox, Rotel, Sansui, Studiocraft, Scott, J.E. Sugden, Sony, Sharp, Technics, Tascam, Tannoy, Thorens.

KIMBERLEY HI-FI

700 ROMFORD ROAD
MANOR PARK
LONDON E12 5AJ
TELEPHONE: 01-478 1176
Open: 9.30-5.30 Mon-Sat (Closed Thurs)

Agents for: ADC, Akai, Armstrong, Ariston, Aiwa, B & W, Bose, Celef, Castle, Edwardus, JBL, JVC, KEF, Keesonic, Mordaunt-Short, Monitor Audio, Pioneer, Panasonic, Sony, Studiocraft, Superscope, J.E. Sugden, Sanyo, Technics, Teac, Thorens, Ultracraft.

ADC

Cartridges		Styli	
QLM34	£10.50	RSQ34	£7.95
QLM36	£16.95	RSQ36	£11.95
VLM III	£25.95	RSV	£13.95
XLM III	£35.95	RSX	£17.95
ZLM	£55.00	RSZ	£24.95
Headshell	LMG1	..	£4.50
Equalisers	SS1	..	£58.00
	SS110	..	£92.00
	SS2 MkII	..	£148.00
	SS3	..	£205.00

GRADO

Cartridges		Styli	
FCE 1	£13.75	FCE	£8.25
F3E	£19.25	F3C	£11.95
F2	£29.50	F2/S	£13.95
F1	£41.25	F1	£24.75
G1	£72.50	G1	£41.70

ORTOFON

Cartridges		Styli	
FF15E II	£13.90	NF15E II	£8.95
F15E II	£19.50	NFE II	£11.75
VMS20E II	£26.95	D20E II	£16.95
M20FE Super	£34.35	D20ES	£22.00
M20FL	£39.00	D20FL	£25.50
MC10	£47.25		
MC20	£66.50		
MC10/ STAM72	£66.50		
MCA10	£64.75		
LM20	£36.50	CL20	£25.50
LM20	£50.00	CL30	£34.35
Concord 20	£42.50	CL20	£25.50
Concord 30	£57.25	CL30	£34.35
210 (Capacitor)	£2.00		

GOLDRING

Cartridges			
G820DJ	£13.50		
G900E	£16.50		
G900SE Mk.II	£33.00	Styli	
G900IGC	£49.00	D130D	£6.95

PICKERING

XV15100	£15.00	D100	£12.50
XV15140E	£20.50	D140	£15.75
XV15400E	£26.00	D400	£21.50
XV15625E	£29.50	D625	£21.50
XSV3000	£69.00	D3000	£34.00

AKG

P6R	£14.00	X6R	£7.40
P6E	£18.35	X6E	£9.00
P7E	£27.75	X7E	£14.30
P8E	£51.00	X8E	£31.20
P8ES	£58.50	X8ES	£35.70

SHURE

M3D	£5.00	N3D	£3.30
M44/E	£7.60	N44/E	£5.00
M44/7	£7.20	N44/7	£4.60
M55/E	£8.60	N55/E	£5.70
M75/6	£7.40	N75/6	£4.80
M75/CS	£6.35	N75CS	£3.75
M75EJ	£12.50	N75EJ	£7.66
M75ED	£14.40	N75ED	£10.80
M95EJ	£13.20	N95EJ	£8.10
M97ED	£29.20	N97ED	£17.20
M95ED	£19.25	N95ED	£14.00
M95HE	£20.50	N95HE	£15.00
M97B	£19.30	N97B	£6.40
M97GD	£22.20	N97GD	£9.40
M97EJ	£22.20	N97EJ	£9.40
M97HE	£32.64	N97HE	£19.60
V15III	£48.00	VN35E III	£15.60
		VN35HE	£18.00
V15IV	£64.00	VN45HE	£22.50

78 Styli STOCKED PLEASE RING

ULTIMO 10X £53.00
Also many types of replacement styli in stock at all branches, enquiries welcome

PICK UP ARMS AND ACCESSORIES

HADCOCK		
GH228/Unilift	..	£68.00
GH228/D Type	..	£86.00
GH228/E Type	..	£86.00
Unilift	..	£9.00
SME Plate	..	£4.40
1ml Silicon Fluid	..	£1.80
2ml Silicon Fluid	..	£2.90
SME		
3009/Non Det	..	£55.60
3009/S2	..	£61.00
Series IIIS	..	£73.95
Series II	..	£101.95
FD200	..	£16.95,
FDIIIS	..	£9.95
CAI	..	£14.95
S2 Headshell	..	£5.20
Mayware Formula IV	..	£49.45
Mayware SME Plate	..	£3.83
Mayware Mounting Kit Thorens TD160	..	£5.75
Mayware Headshell	..	£5.75
Mayware Moving Coil Cartridge MC/2C	..	£49.45
MC/3C	..	£49.45

RECORDCARE

Watts Dust Bug	..	£2.20
Watts Manual Parastat	..	£6.00
Disc Preener	..	£1.20
Decca Record Brush	..	£6.00
Decca Sweep Arm	..	£6.00
Permostat	..	£4.99
Permostat Refill 2.5oz	..	£3.25
Permostat Jumbo 8oz	..	£5.95
Zerostat	..	£6.25
Monitor Audio Sty-lift	..	£5.95
Howland-West Protractor		£0.95
Yulon Record Clamp	..	£7.50
Ariston Turntable Matt	..	£9.95
Pixall Cleaner	..	£4.10
,, Refill	..	£0.80

SOUND GUARD

Record Cleaner Kit	..	£4.99
Record Cleaner Refill	..	£2.99
Preservative Kit	..	£4.99
Preservative Refill 5ml	..	£3.24
Preservative Refill 177ml		£7.99
Total Record Care Kit	..	£9.48
Work Pad	..	£4.99
Stylus Care Kit	..	£5.45

TEST RECORDS

Shure TR115-ERAIV	..	£5.00
Howland-West HFS75	..	£3.25
Ortofon Direct Cut	..	£11.00

THE NEW GROUP OF HIGH PERFORMANCE DEALERS

SPEAKER CABLE

MONITOR AUDIO	
5 metre ..	£18.00
7.5 metre ..	£26.00
QED — See Listing	

TAPE ACCESSORIES

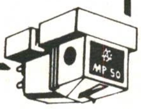
REEL TO REEL	
Leader Tape Red, Blue, Green, Yellow, White ..	£0.60
Splicing Tape ..	£0.60
Stop Foil ..	£1.20
CASSETTE	
Leader Tape ..	£0.60
Splicing Tape ..	£0.60

ALLSOP

Not just a head cleaner, the revolutionary Allsop 3 also cleans dirt from the capstan and pinch roller

£3.95

NAGAOKA/ OSAWA HIRAOKA

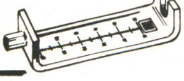


CARTRIDGES	
MP11 ..	£14.85
MP20 ..	£33.55
MP50 ..	£68.75
DISK MATTS	
Disk SE22 ..	£12.99
Disk OM10	£8.66
Anti Static Record Sleeves 50p	£4.50
RC100 Rolling Cleaner ..	£6.90
RC200 Rolling Cleaner ..	£9.90

HEADPHONES

SENNHEISSER	
HD400 ..	£12.35
HD420 ..	£24.25
HD430 ..	£33.50
HD414X ..	£20.75
HD424X ..	£29.50
BEYER	
DR100/K ..	£36.85
DT220/7 ..	£30.75
DT302/7 ..	£14.75
DT440/T ..	£30.75
DT441 ..	£38.50
PIONEER	
SE205 ..	£12.00
SE305 ..	£18.00
SE505 ..	£38.00
Monitor ..	£36.00

ELITE



The new Elite Electronics arm geometry analyser means, that for the first time, you can align your cartridge for the lowest possible distortion.

Detachable Type ..		£4.99
Std. Fixed Headshell Type		£4.99
CARTRIDGES		
EE1300H ..		£13.99
EE1400H ..		£23.50
EE1500H ..		£45.00
PARABOLIC STYLI REPLACEMENTS		
Stanton 500	EEI517 ..	£16.95
680/681	EEI518 ..	£23.00
Ortofon FF15E II	EEI531 ..	£16.95
F15E II	EEI529 ..	£16.95
VMS20EE II	EEI527 ..	£23.00
ADC VLM I II III	EEI507 ..	£26.00
YLM I II III	EEI507 ..	£26.00

TDK

	46	60	90	120
DYN	£0.60	£0.68	£0.90	£1.24
AD	£0.88	£0.98	£1.35	£1.82
OD		£1.11	£1.62	
SA		£1.22	£1.74	

SAX — not yet available

Metal MA	£3.35
Metal Marc	£4.65

Endless Loop Cassettes	
EC 20 Sec ..	£1.95
EC 30 Sec ..	£1.95
EC 1 Min ..	£1.95
EC 3 Min ..	£2.10
EC 6 Min ..	£2.40

TDK Reel to Reel	7"	10"
L	£3.65	£10.65
LB	£4.40	£11.95

TDK Accessories	
Head Cleaner HCI ..	£0.95
Demagnetizer HDO1 ..	£8.75
Universal/Denmag HDII ..	£16.50
Index Cards EX25 ..	£1.20
Cassette Labels EL40 ..	£1.20
TDK Video VHS	
E60 ..	£6.25
E120 ..	£8.50
E180 ..	£10.00

HITACHI

HITACHI Cassettes	60	90	120
LN	£0.60	£0.85	
UDC	£0.97	£1.21	
Uder (UDXL I)	£1.32	£1.65	
Udex (UDXL II)	£1.32	£1.65	

BASF

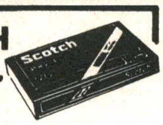
BASF	60	90	120
LH	£0.66	£0.88	£1.32
Super Ferro LH	£0.91	£1.23	£1.60
LHI	£1.03	£1.38	£1.81
CrO2	£1.21	£1.58	£2.36
Fe/Cr	£1.52	£2.10	—
Super CrO2	£1.75	£2.31	—

BASF Reel to Reel	5"	5¾"	7"
Ferro LH LP	£3.25	£3.70	£5.05
DP	£3.10	£5.05	£6.60
TP	£5.05	£6.60	£9.92
Plastic Empty Spool	£0.60	£0.70	£0.80

FUJI

Fuji Cassette Tapes	46	60	90	120
FL	£0.54	£0.59	£0.81	£1.12
FXI	£0.72	£0.85	£1.08	—
FXII	£0.87	£0.99	£1.35	—
Metal		£2.85	£4.00	—

SCOTCH



SCOTCH	46	60	90
HI Energy		£0.97	£1.22
Master I		£1.26	£1.42
Master II		£1.57	£1.91
Master III		£1.65	£2.00
Metafine	£2.65	£3.65	—

SCOTCH Reel to Reel	7"	10½"
207	£5.75	£13.75
Scotch Dust Guard Mat ..		£2.99

CASSETTE TAPES	60	90
Denon DX3	£1.26	£1.69
DX5	£1.52	£2.10
DX6	£1.52	£2.10
Maxell UL	£0.74	£0.95
UD	£1.18	£1.34
UDXLI	£1.49	£1.86
UDXLII	£1.61	£2.05

Reel to Reel	7"		10½"
UD35/90	£4.96	180B	£10.54
UDXL 35/90B	£6.30	180B	£14.36

VIDEO TAPES	
VHS E60 ..	£6.25
E120 ..	£8.50
E180 ..	£10.00
Maxell Cleaning VHS Tape	£8.00

SONY

	46	60	90	120
CHF		£0.63	£0.89	£1.19
BHF		£0.88	£1.05	£1.28
AHF	£0.86	£0.99	£1.27	
ALPHA		£1.23	£1.62	
FERRO	£1.19	£1.47	£1.85	

METAL Please Ring

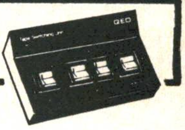
Reel to Reel	7"	10½"
SLH7/550BL	£5.30	
FeCr II/1100		£14.90
Betamax L125	£5.30	
L250	£5.95	
L370	£6.55	
L500	£7.80	
L750	£10.00	
Sony Styli ND132G ..		£6.75
ND133G ..		£6.75
ND134G ..		£8.65
ND136G ..		£7.50
ND137G ..		£8.25

Most of Sony Hi-Fi range stocked at all branches.

TARGET

Target Speaker Stands	
TAP 1 ..	£17.95
TAP 2	£21.00
TAP 3 (Wall Brackets) ..	£12.95
TAP 6 (Adjustable height)	£16.95

QED



42 strand spkr cable per metre	£0.30
97 strand spkr cable per metre	£0.70
Tape Switching 2-way Din	£15.50
Tape Switching 2-way Phono	£20.00
Tape Switching 3-way Din	£19.35
Tape Switching 3-way Phono	£26.00

Full range stocked — please ring for prices.

AUDIO TECHNICA

Safety Raiser	£10.95
Disc Stabilizer AT 618	£11.00
Audio Insulator Feet AT 605	£14.00
Anti Static Liquid AT 608 II	£0.75
Sweeper Arm AT 6002	£4.50
Stylus Cleaning Liquid AT 607	£1.20

RECOMMENDED SYSTEM

TECHNICS Z RACK SYSTEM c/w Linear Phase Speakers

Only £359.95

MAIL ORDER TO BARTLETTS

If it's convenient to visit one of our stores, you can satisfy your requirements by post from BARTLETTS Phone 01-607-2148 (24 hrs) or return coupon with remittance to Bartletts, 175 Holloway Rd., London N7 8JB.

FREE CARRIAGE ON ALL HIFI MAIL ORDER

Send to: BARTLETTS HIFI, 175 Holloway Road, N7 8JB.
Please send the following items

Quantity	Make	Type	Cost

I enclose a cheque/PO made payable to Bartletts Hifi for £.....

or debit my Access Barclaycard No.......................

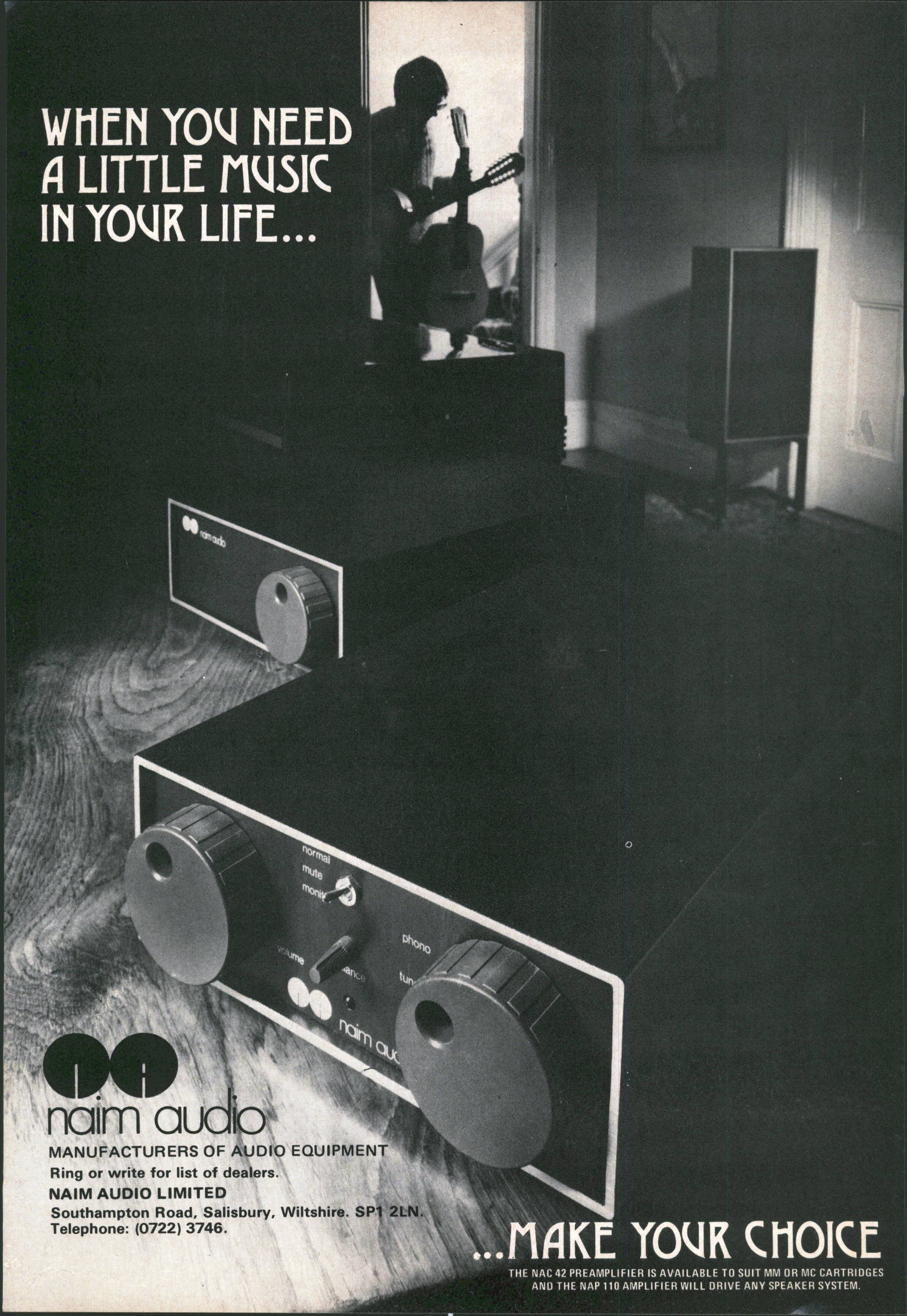
Name...

Address...

....

Signature ....PR 7/80

WHEN YOU NEED A LITTLE MUSIC IN YOUR LIFE...



naim audio

MANUFACTURERS OF AUDIO EQUIPMENT

Ring or write for list of dealers.

NAIM AUDIO LIMITED
Southampton Road, Salisbury, Wiltshire. SP1 2LN.
Telephone: (0722) 3746.

...MAKE YOUR CHOICE

THE NAC 42 PREAMPLIFIER IS AVAILABLE TO SUIT MM OR MC CARTRIDGES AND THE NAP 110 AMPLIFIER WILL DRIVE ANY SPEAKER SYSTEM.

Stop Interference Now!

The increasing problem of mains borne interference caused by such things as refrigerators, lamp dimmers, drills and heaters etc., can now be overcome by using this plug-in suppressor.

Inserted between the amplifier and wall socket, most forms of mains borne interference will be cured. This device will not suppress radiated interference transmitted through the air.

Fitted with lead terminating in a standard 13 amp mains plug.

PRICES (Inc. VAT)
750 Watt version (type 6/2): £14.94
1500 Watt version (type 6/4): £19.98

QED AUDIO PRODUCTS LIMITED
Unit 12, Ashford Industrial Estate, Shield Road, Ashford, Middx.

Our prices are music to your ears.

Trio KR 2090/L
3-band tuner amplifier.
Boots Normal Price £135.
Clearance Offer Price £79.50

Sansui FRB 200
Belt-drive semi-auto turntable.
Boots Normal Price £69.
Clearance Offer Price £49.

Trio KX 530
Dolby Cassette deck, direct loading. Boots Normal Price £129.95. **Clearance Offer Price £85.50**

Wharfedale Shelton x P2
Loudspeakers,teak 30w handling. Boots Normal Price £65 per pair. **Clearance Offer Price £55 per pair**

From larger Boots Audio Departments. Reduced to clear while limited stocks last.

Boots

Value with the Special Touch

PICKERING COURT ORDER

PICKERING recently became aware of the distribution both in the US and Europe, of a lavish brochure produced by the company E. V. Game, promoting the Pro-Mag Series replacement styli.

Among the styli offered, Pickering replacement styli figured prominently and were shown in a way which might lead the public to believe that the product was produced by them.

Pickering and Co. was the only firm — of six mentioned in the brochure — which took E. V. Game to court in the US. This court issued a 'Cease and Desist' order which obliges E. V. Game to call back all issued brochures and to re-design them — should further publication take place — in a way which would clearly indicate that the product offered is in fact an imitation of an original product and has no relationship with the product manufactured by Pickering.

This, Pickering maintain, is particularly important, as some of the styli were offered with Shibata diamonds, whereas Pickering products use the trade marked Stereohedron diamond. Additionally, the styli lacked the distinctive 'PC' mark on the front of the plastic stylus handle.

Sulkin service move

IMPROVED working facilities and additional storage space have resulted from the move of Sulkin (UK) Ltd's service department to its new Peckham location.

"Both Crown and York product ranges have expanded comprehensively in recent years", said service manager Arthur Corley. *"We need to carry spare parts for Crown products going back twelve years"*, he pointed out.

Numbered among the company's service team involved in the move, are several fully-trained Japanese engineers.

Audio restoration laboratory

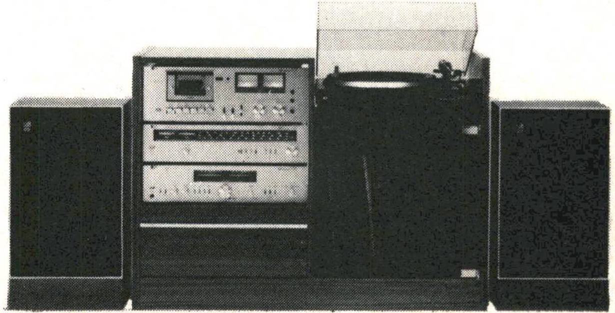
THE COUNTRY Music Foundation Library and Media Center of Nashville, Tennessee, USA, has opened a new Audio Restoration Laboratory. It is claimed to be the most sophisticated facility in the USA for restoring the sound on pre-stereo recordings to its original quality.

The Laboratory is capable of producing master tapes from original recordings, test pressings, transcriptions and early tape masters. Its equipment includes variable-speed two-track ¼-inch tape decks, full-track mono mastering machines, sound filtering and equalization equipment, special styli for different record groove sizes, and special noise supression units designed for audio restoration work.

Bill Ivey, Director of the Country Music Foundation said: *"A primary use of our Laboratory will be for our Library and Media Center to preserve the sound on materials that are disintergrating. The best example of this, is acetate radio transcriptions, which literally fall apart with the passing of time.*

"We also hope that this Laboratory, by being in the centre of the country music recording industry, will stimulate the re-release of historical material in the country field. Country music has lagged a long way behind jazz in reissueing historial recordings."

Slimline system from Pye



Pye's HF3035 System

PYE tell us that they have added many new products to their Hi-Fi Sound range.

"These new additions have a 1980s styling about them," said Dan Bloom, Pye's Hi-Fi Product Manager. *"The designs are more compact, slimline and better-looking."*

One of the new systems with these qualities is the System HF3035. It comprises an SX5685 belt-drive turntable, SX6194 three-band am/fm tuner, SX6393 35 watts per channel amplifier and the SR3170 front-loading Dolby cassette deck. Speakers are type SX6483 and the housing unit, type HU6.

The SX6393 amplifier has a frequency range of 20Hz-20kHz with a total harmonic distortion of 0.08 per cent.

Pye Ltd., 137 Ditton Walk, Cambridge, CB5 8QD.
(Teversham (02205) 2781).

THIS IS THE DAWN OF A NEW ERA IN SOUND FIDELITY

THE GRIFFIN ANACOUSTIC TURNTABLE MAT

During the development of reference systems for the testing of exceedingly accurate high fidelity systems it was found that conventional rubber turntable mats produced a degradation of sound quality. Many commercially available mats were tried and no significant improvement was found.

Griffin decided to develop a mat to obviate these problems and to use it on their laboratory reference turntable. After working out the theory of how the colourations were caused a solution was finally achieved.

This anacoustic mat immediately caused a dramatic improvement in Bass detail, Midrange transient accuracy and Treble smoothness. The most surprising improvement was a dramatic improvement in the location and stability of the stereo image.

However it came as a surprise to find that using this mat on cheaper turntables also made a considerable improvement to the sound quality and image location, in fact the difference was equivalent to changing the turntable to one of twice the price.

Technically the mat damps record vibrations and standing waves, improves record stability and provides a firm base for the immense forces involved in playing the groove undulations. The mat also removes turntable resonances while providing a good coupling to the table at audio frequencies. Rumble and mechanical noise from the mechanism is attenuated by the structure of the material.

WARNING: When purchasing turntable mats it must be made clear that the AUDIBLE difference is the most important factor.

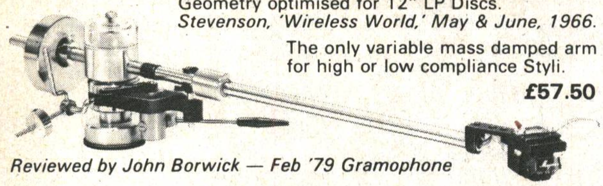
Griffin
pure sound genius
Siddons Factory Estate, Howard Street,
West Bromwich, West Midlands B70 0SU

Available either direct from Griffin or your local dealer
Trade enquiries welcome

Please supply ☐ Anacoustic Table Mats
at **£6·00** each inclusive of V.A.T. postage & packaging
I would also like details of other Griffin Products ☐
Name ______________________
Address ______________________
____
PRAC. HI-FI

MC-3L + FORMULA 4 MkIII ®

The best value in state-of-the-art pickup



Geometry optimised for 12" LP Discs.
Stevenson, 'Wireless World,' May & June, 1966.

The only variable mass damped arm for high or low compliance Styli.

£57.50

Reviewed by John Borwick — Feb '79 Gramophone

MC-2C
MOVING COIL
CARTRIDGE
£49.45

T24 Universal MC Transformer, the quietest best step-up available.
£57.50

NEW

High Output Moving Coil Cartridge MC-3L. **£49.45**

No step-up required.

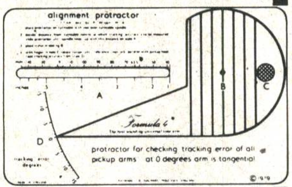
Super-polished special line contact nude diamond stylus for maximum information retrieval.

REVIEWED BY REG WILLIAMSON SEPTEMBER 'HI-FI FOR PLEASURE' and GEOFF GILES DECEMBER 'PRACTICAL HI-FI'

Alignment Protractor MkII

Improve your stereo image. Enables correct setting up of all pick-up arm and cartridge combinations. Measures tracking accuracy over entire disc surface with Stevenson zero error points for minimum distortion. **£3.45 post free.**

Devised by Percy Wilson M.A. Original 'Hi-Fi News' Review available.


alignment protractor
A
B
C
D
Formula 4
protractor for checking tracking error of all pickup arms at 0 degrees arm is tangential
tracking error degrees
© 1979

All items available from selected dealers or if in difficulty, from

MAYWARE LTD (Dept. PHF7)
P.O. Box 58, Edgware, Middlesex HA8 9UH Tel: 01-958 9421

SCARFE
AUDIO
VISUAL

AMPLIFIERS

JVC JAS44	188.00
JVC JAS55	£220.00
JVC JAS77	POA
JVC AS5	POA
Lux L2	POA
Lux L3	POA
Lux L5	POA
Sansui A40	£68.90
Sansui A60	£99.00
Sansui A80	POA
Sansui AU217	£110.00
Sansui AU317	£165.00
Trio KA701	POA
ADC SS110 EQ	£99.00
ADC SS2 EQ	£153.00

TUNERS

JVC JTV77	POA
Sansui T60	£68.90
Sansui T80	£110.00
Sansui TU217	£96.90
Teac TX300	POA
Teac TX500	POA
Lux T2	POA

RECEIVERS

Sansui TA300	£165.00
Sansui TA500	£199.00
Trio KR3010L	£130.00
Trio KR4010	£175.00
Audio Pro TA150	£525.00

LOUDSPEAKERS

IMF Super Compact	POA
IMF ALS30	POA
IMF ALS40	POA
IMF TLS50	POA
IMF TLS80	POA
Tannoy Oxford	POA
Tannoy Cambridge	POA
Tannoy Mayfair	£369.00
Castle Richmond	£96.00
Mordaunt-Short Carnival	POA
Mordaunt-Short Festival	POA
Mordaunt-Short Pageant	POA

TURNTABLES

Sansui SR222, Mk. II	£64.90
Lux PD272	POA
Lux PD264	POA
Teac PX300	POA
Micro-Seiki MB10	£69.00
ADC 1700	£119.00

CASSETTE DECKS

JVC KD10	POA
JVC KDA5 (inc. remote)	£223.00
JVC KD65	£242.00
Sansui D90	£89.90
Sansui SC1330	£138.00
Sansui SC3300	£195.00
Trio KX500	£125.00
Teac CX210	POA
Teac CX270	POA
Teac C3	POA
Teac A108 Sync	POA
Lux K5	POA
Lux K10	POA

MAIL ORDER WELCOME

161 UNTHANK ROAD, NORWICH.
BARCLAYCARD VISA Tele. (0603) 22833

A DUO FROM TRIO

THE latest models to come from Trio and on show at Hi-Fi 80, have some interestingly original features which overcome magnetic distortion problems.

The first is the L-01A Hi-Speed integrated amplifier. To prevent magnetic distortion, all magnetic material has been eliminated and the power supply is completely independent. It has 1.5 times the capacity of conventional power sources for 100-watt class amplifiers and is extremely stable, providing excellent power linearity with very low magnetic distortion.

A feature of the L-01A is the nf loop configuration which has been extended to include the dc output relay. Here Trio have achieved a very high damping factor of 1000, which renders the pre- and main amplifiers' speaker control capacity equal to the L-07 series direct drive amplifier system.

Internal signal network wiring is probably the shortest in the world for this type of amplifier, being only 50 per cent of conventional wiring systems.

Specifications of the L-01A are: 110+110-watt rms output, (20Hz-20kHz at eight ohms); slew rate +150V/µs; rise time 0.7µs; and total harmonic distortion 0.006 per cent.

The L-01T pulse count detector fm tuner is also built from non-magnetic materials. Separate power supplies at each stage prevent any adverse effects on sound quality and a second transformer has been added to provide independent power for the local oscillator.

RF cross modulation and reduced sensitivity are eliminated by simply bypassing the rf amplifier and carrying the input signal direct to the mixer. The rf selector can be set at direct conversion for areas of high field strength, or normal high sensitivity position for areas of low field strength.

A special design feature of this tuner, is synchro touch-tuning. It gives full tuning dial illumination with an automatic time lapse which reduces lighting to the area of the tuned frequency only after two seconds, except for the function indicators.

Specifications of the L-01T are: sensitivity; mono signal-to-noise ratio 26dB, 40kHz dev; 0.6µV; stereo signal-to-noise ratio 46dB, 46kHz dev; 22µV. Total harmonic distortion: stereo 46dB dev, 1kHz 0.05 per cent (if wide). Selectivity: 300kHz, 20dB input: 45dB (wide) 80dB (narrow).

Both these items were the subject of a technical paper presented by senior engineers of the Trio-Kenwood Corporation at the Audio Engineering Society Conference, London, in February.

B. H. Morris and Co (Radio) Ltd, Precision Centre, Heather Park Drive, Wembley, Middlesex. (01-902 9422).

Hitachi 'portable'

HITACHI'S new portable radio cassette recorder, model TRK 915E features a quartz digital clock timer with crystal oscillator clock accurate to within one second a month. This can be set to automatically switch the radio and cassette sections on and off.

IC power amplifiers provide 7½ watts per channel through two detachable speakers — each containing a 12cm (4¾-inch) woofer and 5cm (2-inch) tweeter.

The TRK 915E operates from mains or internal batteries and covers mw/lw/fm stereo bands. Separate bass/treble controls are provided with a led fm stereo indicator. There is also a led mode indicator, stereo 'wide' switch and a loudness control.

The cassette section has an air-damped eject system and a three-position tape selector for chrome, FeCr and normal tapes. There is a cue and review facility, a led tape-running indicator and a variable sound monitoring system.

The TRK 915E

Twin VU meters are provided along with twin condenser microphones. A full line-up of input and output sockets is provided, including external stereo microphones and remote control. Price is £249.

Hitachi (UK) Ltd., Hitachi House, Station Road, Hayes, Middlesex UB3 4DR. (01-848 8787)

What every cassette deck wants to be when it grows up.

The Teac X Series of open-reel tape decks are the answer to every young cassette deck's dreams.

They're big, powerful and handsome. And they give you the exceptional range of creative possibilities that you can only get on versatile reel-to-reel machines.

For a start, all four machines in the range can run at either 7½ ips or 3¾ ips if you want longer recording time. At 7½ ips the tape moves four times faster than a cassette. This means that all audio frequencies can be recorded at higher levels without the risk of tape saturation and resulting distortion.

Add to that the fact that ¼" tape has twice the track width and twice the oxide thickness of cassette tape and you've got yourself 16 times more magnetic particles to store and remember the music. Plus greatly increased output and superior signal to noise ratio.

Teac's tradition of combining technology with innovation has made us one of the most respected names in professional recording. So when we designed the X Series (X7, X7R, X10 and X10R), we put in a mix of computer-age sophistication and sheer brute strength.

There's the fact that the X Series are powered by three DC motors. And in our drive to cut wow and flutter to an absolute minimum, we isolated the tape with a dual capstan (closed loop) to protect the tape from outside influences, and reduce head wear.

All the machines offer the sophistication of a Pitch Control, which allows fine correction of tape speed

X10R features include: Dual-capstan closed-loop transport. Wow & Flutter ·03% at 7½ ips (NAB weighted). 10½" reel capacity. Pitch Control. LSI logic control. Optional remote control and dbx noise reduction

during recording and playback.

Electrical brakes on the X10 and the X10R stop the tape fast but still handle it with kid gloves. That way your valuable tapes last longer. And both the X7R and X10R machines have a bi-directional facility so that you can playback or record in either direction for up to six hours without interruptions.

Another exclusive feature is that the X10 and X10R have a dual action cue lever. This lets you listen in during fast rewinds to make editing quicker, easier and much more precise.

The brain behind these powerful machines is the equally powerful logic control system. At the touch of a button the integrated circuit carries out your instructions though it won't let you make a single mistake.

For a full technical breakdown on each machine, simply send off the coupon. Prices range from around £399.00 for the X7 to around £559.00 for the X10R.

Much the same as you'd expect to pay for one of the more ambitious youngsters.

For further information please contact Harman UK, St Johns Road, Tylers Green, High Wycombe, Bucks, HP10 8HR. Telephone: Penn (049 481) 5331.

Name

Address

Post Code

PHF TX7

TEAC®

interface. Record mute function. Independent bias and equalization selectors. Precise VU meters. Timer record/playback and bi-directional recording and playback. Frequency response 40-20,000 Hz (+/− 3 dB).

JVC
VHS
VIDEO CASSETTE
E-60
E-120
E-180
Insert this side into recorder
Do not touch the tape inside
THIS SIDE IN
JVC VHS VIDEO CASSETTE E-180
E-30

JVC made the world's first VHS tape... we still do

Since JVC developed and launched the VHS system in 1976, we've made sure we are the leaders in the home video world. Now with 17 other manufacturers adopting our system, VHS is the most popular home video system in the world.

And this year we opened a new factory producing a million VHS cassettes a month. Each and every tape is of the finest quality. We have tapes to suit every need with our half hour, one, two and three hour cassettes.

Superb free offer – Cassette Rack

Now with each purchase of ten or more cassettes, we are giving away totally free, a superb JVC, VHS cassette rack. A stylish and practical way to store ten VHS cassettes.

So why not pop in to your nearest JVC dealer today and pick up the name that started it all?

VHS
PAL

JVC
ANOTHER STEP CLOSER TO REALITY
JVC is the trade mark of the Victor Company of Japan

LASKYS

Hi-Summer SALE

NOW ON

It puts all the others in the shade.

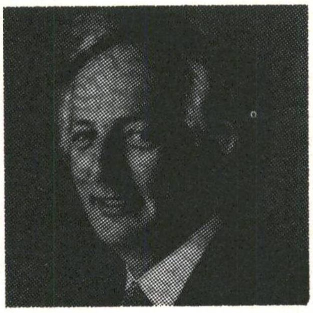
“Only the biggest name in Hi-Fi can have the biggest summer sale.

That may seem rather obvious but at this time of year, when nearly every retailer in town is trying to grab your attention with a cleverly contrived phrase or offer, it's also easy to forget.

The plain fact is that if you want to visit the sale that offers the biggest choice of different manufacturers and the biggest range of equipment from each one all you have to do is come to the biggest Hi-Fi specialist in Europe – Laskys.

And when you do – which is quite easy since we have 38 stores up and down the country – you'll find that we also offer the most comprehensive before and after-sales service Hi-Fi has ever known.

We honestly believe that it's so good we've given it a special name – Laskys Hi-Fidelity Service.



It not only proves that bigger can mean better, but it also ensures that a great bargain today will still look that way tomorrow.

We look forward to seeing you soon.”

P. Kle

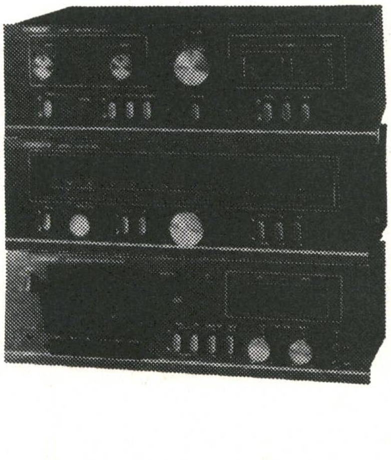
Peter Klein, Managing Director, Laskys.

HIGH FIDELITY SERVICE

TOSHIBA 445 RACK SYSTEM

A beautiful rosewood finish cabinet houses this high performance stereo system. Amplifier – 40 watts per channel RMS, digital power meters. AM/FM tuner – digital readout, LED signal strength indicator, 6 AM/FM pre-sets. Dolby cassette deck – digital meters, metal tape facility. Fully Auto direct drive turntable including cartridge. **Previous discounted price £569.**

SALE PRICE £549



EXCLUSIVE CONSORT 4000 HI-FI SYSTEM

Incredible value exclusive offer. 40 watts per channel RMS amplifier with high filter/loudness controls, MW/LW/VHF stereo tuner with AFC; Dolby cassette deck, many features. Hear it demonstrated today. **Previous discounted price £179.95.**

SALE PRICE £169

LA
HI-SU
SA

Sensational Summer Saver

TRIO KT313 AM/FM STEREO TUNER

Sensitive, with a very clear tuning scale and signal strength and fine tuning meters. A beautiful match for the KA305 amplifier.
Previous discounted price £89.90.

SALE PRICE £59.90

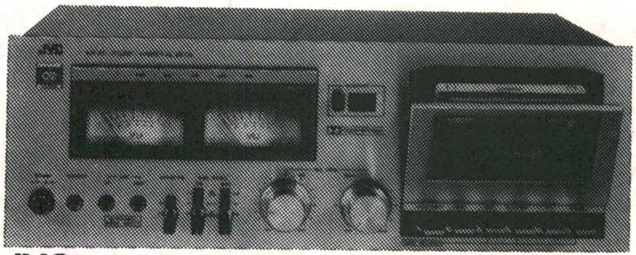
SALE PRICE £69.90

Sensational Summer Saver

TRIO KA305 STEREO AMPLIFIER

Renowned high performance amplifier at a budget price. 40 watts per channel RMS with extremely low distortion. Microphone mixing facility. **Previous discounted price £94.90.**

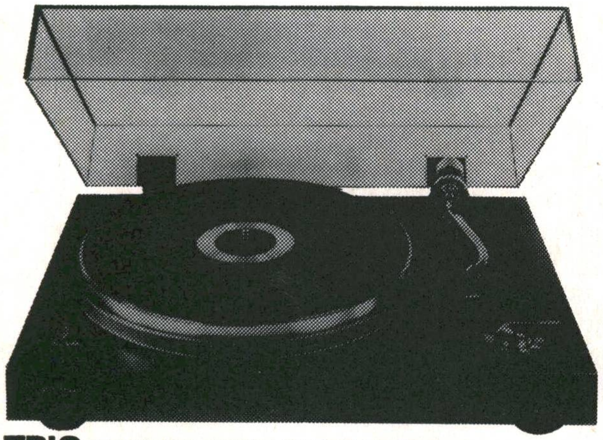
Special sale price TRIO KA305 Amplifier and TRIO KT313 Tuner together only £114.80. Saving a further £15!



JVC KD10B CASSETTE DECK

An elegant sophisticated front loading Dolby cassette deck with 3 position bias/equaliser switches and extremely low wow and flutter, at a special Laskys price. **Previous discounted price £119.90.**

SALE PRICE £88.90



TRIO KD1500 STEREO TURNTABLE

A well designed fully automatic, belt-drive turntable with Stroboscopic speed control. Now less than £50. **Previous discounted price £54.90.**

SALE PRICE £49.90

JVC TV3L STEREO TUNER

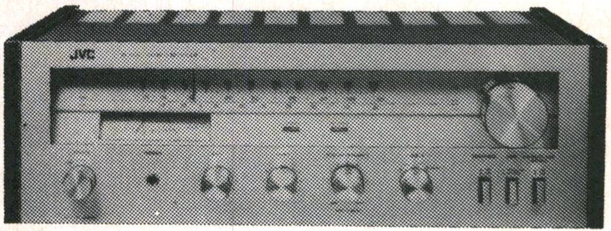
A stylish 3-band LW, MW, FM stereo tuner with FM tuning meter, MW/LW signal strength meter and FM muting.
Previous discounted price £79.90.

SALE PRICE £59.90

LEAK 3020 SPEAKERS

Renowned Leak sound quality at a special price. Compact 2 way system, 12-25 watts RMS power handling. Walnut finish cabinet/black grille.
Previous discounted price £67.90.

SALE PRICE £64.90



JVC JRS61L STEREO RECEIVER

Outstanding JVC quality and styling plus Laskys value. 20 watts per channel RMS, MW/LW/FM stereo.
Previous discounted price £99.95.

SALE PRICE £89.90

SKYS

mmer

LE

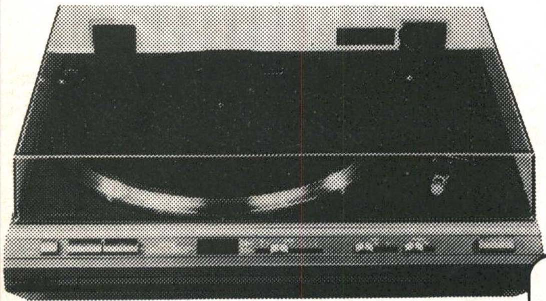
Sensational Summer Saver

SALE PRICE £59.90

AKAI **AM2350 STEREO AMPLIFIER**
Sturdy design, highly recommended in the Hi-Fi press. Full 35 watts RMS per channel, twin power level meters, 3 way speaker connections, tape dubbing facility. **Previous discounted price £89.90.**

HITACHI **D580 CASSETTE DECK**
Twin VU meters, fine bias adjustment, auto-replay, touch button controls and many other features. **Previous discounted price £149.**

SALE PRICE £144.50

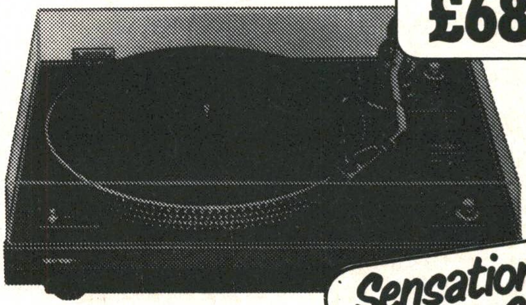


SALE PRICE £109.90

AIWA **AP2400 STEREO TURNTABLE**
Direct drive, front control operation, anti-skating hydraulically damped cueing. New design high sensitivity straight pipe tone arm. **Previous discounted price £119.90.**

GARRARD **DD130 STEREO TURNTABLE**
Incredible value – a direct drive from a renowned turntable manufacturer including Shure M75ED cartridge for less than £70.
Previous discounted price £79.90.

SALE PRICE £68.90

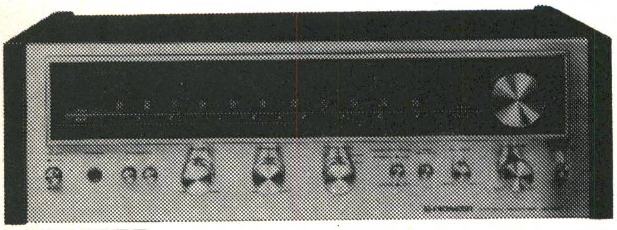


Sensational Summer Saver

Exclusive Summer Saver

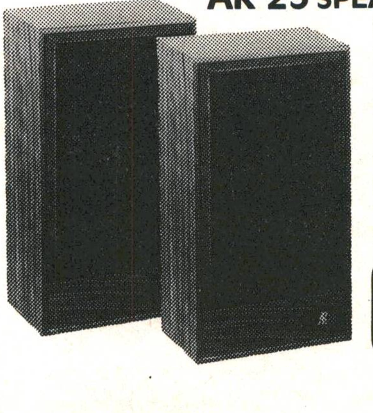
NIKKO **NA690 STEREO AMPLIFIER**
Attractive black finish. 45 watts per channel RMS for less than £75. THD 0.04%. Dual power output meters, subsonic filter. Exclusive to Laskys. **Previous discounted price £94.95.**

SALE PRICE £74.50



PIONEER **SX590 AM/FM STEREO RECEIVER**
20 watts RMS per channel. Twin power meters, tuning meter. Connections for 2 pairs of speakers. **Previous discounted price £99.90.**

SALE PRICE £94.90



AR 25 **SPEAKERS**
Superb performance two way system with 250mm woofer and 32mm pressure high-range. Highrange contour control switch. Handles up to 100 watts per channel. Beautifully finished walnut veneer cabinets. **Previous discounted price £129.90.**

SALE PRICE £124.50

LASKYS Hi-Summer SALE

Call in to your local Laskys to see the full range of Hi-Summer savers. To tempt you, here are a few more examples.

AMPLIFIERS

Akai AM2250 Stereo Amplifier, previous discounted price £69.90. **Sale price £59.90.**

JVC AS5 Stereo Amplifier, previous discounted price £69.90. **Sale price £67.90.**

Nikko NA790 Stereo Amplifier, previous discounted price £99.90. **Sale price £79.90.**

Pioneer SA508 Stereo Amplifier, previous discounted price £94.90. **Sale price £89.90.**

Pioneer SA408 Stereo Amplifier, previous discounted price £59.90. **Sale price £57.90.**

Technics SU8011 Stereo Amplifier, previous discounted price 79.90. **Sale price £74.90.**

Trio KA405 Stereo Amplifier, previous discounted price £146.90. **Sale price £139.90.**

TUNERS

Nikko NT360 Stereo Tuner, previous discounted price £64.90. **Sale price £49.90.**

Nikko NT890 Stereo Tuner, previous discounted price £119.90. **Sale price £89.90.**

Trio KT5300 Stereo Tuner, previous discounted price £59.90. **Sale price £39.90.**

RECEIVERS

Akai AA1135 Stereo Receiver, previous discounted price £139.90. **Sale price £129.90.**

Nikko NR519 Stereo Receiver, previous discounted price £94.90. **Sale price £79.90.**

Nikko NR819 Stereo Receiver, previous discounted price £124.95. **Sale price £98.90.**

Rotel RX603 Stereo Receiver, previous discounted price £149.00. **Sale price £139.90.**

Trio KR2010L Stereo Receiver, previous discounted price £99.90. **Sale price £89.90.**

TURNTABLES

BSR P200 Stereo Turntable, previous discounted price £39.90. **Sale price £34.90.**

Garrard GT20 Stereo Turntable, previous discounted price £54.90. **Sale price £49.90.**

Garrard DD132 Stereo Turntable, previous discounted price £89.90. **Sale price £84.50.**

CASSETTE DECKS

Aiwa AD6900 Stereo cassette deck, previous discounted price £298.00. **Sale price £279.00.**

Akai CS703D Stereo cassette deck, previous discounted price £79.90. **Sale price £69.90.**

JVC KDA2 Stereo cassette deck, previous discounted price £89.00. **Summer Special Offer £79.90.**

JVC KD720 Stereo cassette deck, previous discounted price £89.00. **Sale price £79.90.**

Sony TCU2 Stereo cassette deck, previous discounted price £99.90. **Sale price £89.90.**

Technics RSM10/10K Stereo cassette deck, previous discounted price £99.90. **Sale price £89.90.**

Toshiba PCX10 Stereo cassette deck, previous discounted price £79.90. **Sale price £74.90.**

SPEAKERS

Leak 3080 Speakers, previous discounted price £198.00. **Sale price £189.90.**

RADIOS

Panasonic RF1103DLB, previous discounted price £33.50. **Sale price £29.90.**

Pye 1416, previous discounted price £19.90, **Sale price £18.90.**

Sony TFM7720L, previous discounted price £29.95. **Sale price £28.90.**

PORTABLE CASSETTE PLAYERS

Hitachi TRQ247, previous discounted price £24.90. **Sale price £23.90.**

Panasonic RQ2106, previous discounted price £29.95. **Sale price £28.90.**

MONO RADIO CASSETTE RECORDERS

Aiwa TPR140, previous discounted price £49.90. **Summer Special Offer £39.90.**

Aiwa TPR180, previous discounted price £69.90. **Summer Special Offer £49.90.**

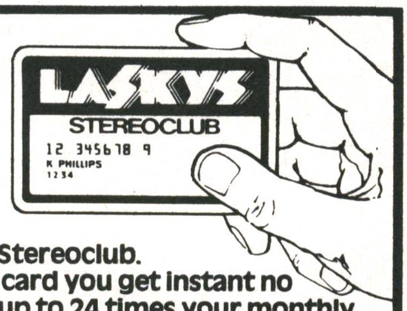
Akai AJ360, previous discounted price £59.90. **Sale price £54.90.**

Sony CFM31, previous discounted price £64.50. **Sale price £59.90.**

STEREO RADIO CASSETTE RECORDERS

Audiotronic SRC77, previous discounted price £57.90. **Sale price £49.90.**

Stereoclub the easy way to buy better Hi-Fi.



Buy through Laskys Stereoclub. Once you have your card you get instant no deposit credit right up to 24 times your monthly payment. For payments of just £5 a month you would get credit up to £120.

*From June 1st 1980 interest charged at 2.5% per month on monthly balance outstanding Equivalent to annual rate 34.49%. Interest rate and prices including 15% VAT are correct at time of going to press and subject to alteration without notice. All offers subject to availability

Mail Order: If you can't get to your local Laskys just post your order to:
LASKYS The Hyde, London NW9 6JJ or telephone 01-200 0444.
Add £4.50 per item Securicor delivery (UK mainland only)

Please send me ______

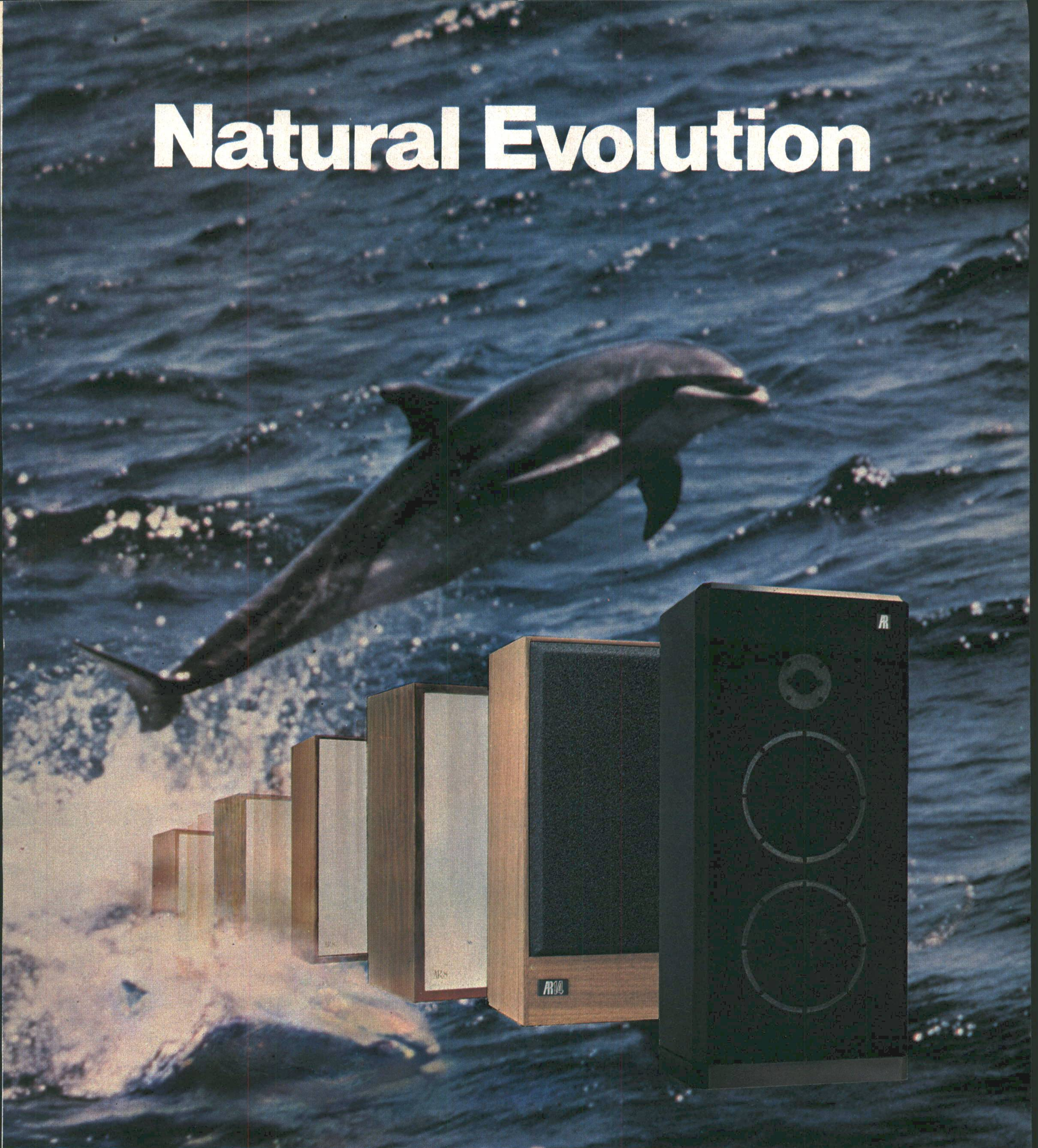
Payment details please tick where applicable
1 Please charge to my Stereoclub account ☐ account no. ______
2 I would like to apply for a Stereoclub account ☐
3 I enclose full cash payment ☐ £ ______ cheque/P.O. no. ______
4 Please charge to my Barclaycard/Access/Diners Club/American Express ☐
Credit Card No. ______
All costs refunded if goods returned within 7 days in perfect condition.
Name ______
Address ______
Signature ______ Date ______
Allow 28 days for delivery. All items subject to availability.
UK Mainland only.
PRA/JULY

Hardman Hi-Fi Centres Ltd., Chancel House, Neasden Lane, London NW10 2XE. Registered No. 347947.

Listen to the leaders LASKYS

LASKYS SUPERSTORES: London – 42 Tottenham Court Road. Tel: 01-636 0845. **Birmingham** – 19/21 Corporation Street. Tel: 021-632 6303. **Bristol** – 16/18/20 Penn Street. Tel: 0272 20421. **Chester** – The Forum, Northgate Street. Tel: 0244 317667. **Edinburgh** – St. James Centre. Tel: 031-5562914. **Glasgow** – 22/24 West Nile Street. Tel: 041-226 3349. **Kingston** – 38/40 Eden Street. Tel: 01-546 1271. **Liverpool** – 33 Dale Street. Tel: 051-236 2828. **Manchester** – St. Mary's Gate, Market Street. Tel: 061-832 6087. **Preston** – Guildhall Arcade. Tel: 0772 59264. **Sheffield** – 58 Leopold Street. Tel: 0742 750971. **Slough** – 65 Queensmere Centre. Tel: 75 24401.

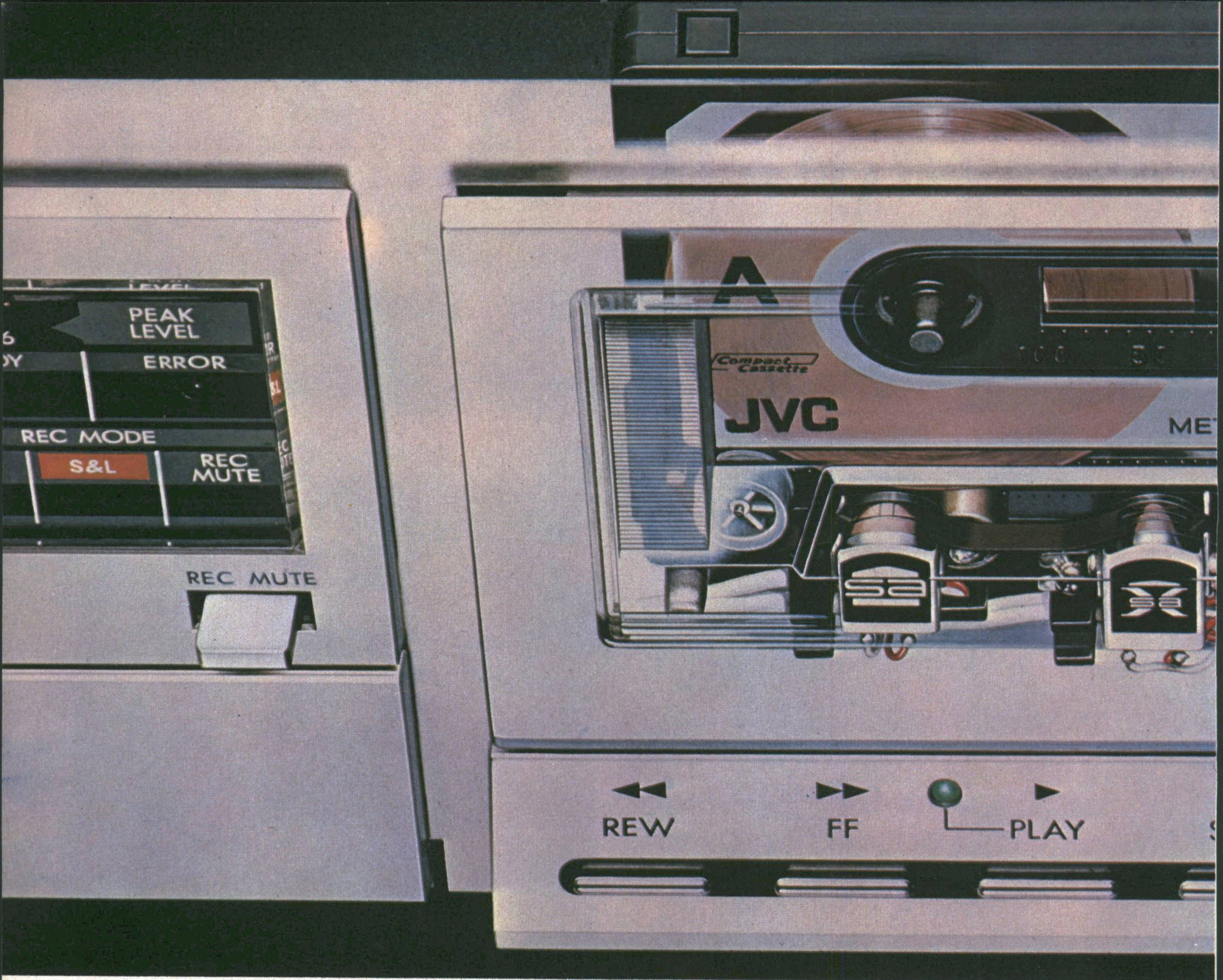
AND NATIONWIDE: London (8 Branches), Birmingham (2 Branches), Cardiff, Chatham, Colchester, Croydon, Dartford, Golders Green, Leicester, Manchester (2 Branches), Northampton, Nottingham, Oxford, Reading, Richmond, Romford, Sheffield (2 Branches), Tunbridge Wells, Wolverhampton, Watford.



AR call it HIGH-TECH

HIGH-TECH is a practical approach to design which gives first priority to performance; but as nature shows with the dolphin when "form follows function" the results are handsome, streamlined and perfectly suited to their environment.
Find out now how **HIGH-TECH** has come to Hi-Fi.
Send for free colour brochure.

TELEDYNE ACOUSTIC RESEARCH
High Street, Houghton Regis, Dunstable, Beds. LU5 5QJ.



The JVC guide to met

Or how we used our heads to improve your hearing.

If you're reading this you've probably at least heard of the metal tape revolution. But how much more do you really know about the quantum leaps that have recently been made? At JVC we believe you need the hard facts before you hear the soft sell.

What is metal tape?

Ever since cassette tapes were introduced manufacturers have been experimenting to find better materials for magnetically storing sound information for high fidelity reproduction.

First there was ferric tape, then chrome, then ferrichrome. But they all had one limitation. They all used oxidised ("rusted") particles in their emulsion.

Now there's a new tape. It uses *un*oxidised ferric particles to store electrical impulse on cassette tape. It's a pure iron tape. And it's bringing the once humble cassette deck into the reel-to-reel class. Musical reality has never been so close.

Metal tape can store far more information than conventional tapes. So it's possible to increase the maximum output level through the full frequency range, achieving a better frequency response and a wider dynamic range at high frequency.

You have to hear it. Then you'll believe it.

The JVC connection.

Fifty years of hi-fi experience have made our hearing pretty acute. So we worked closely with manufacturers of tape itself to produce the necessary decks.

Conventional deck heads will not properly record and erase metal tape – they reach saturation point well before the tape does. So a metal tape cassette must have specially designed heads and amps. Many manufacturers are striving to provide this.

We invented the answer 5 years ago!

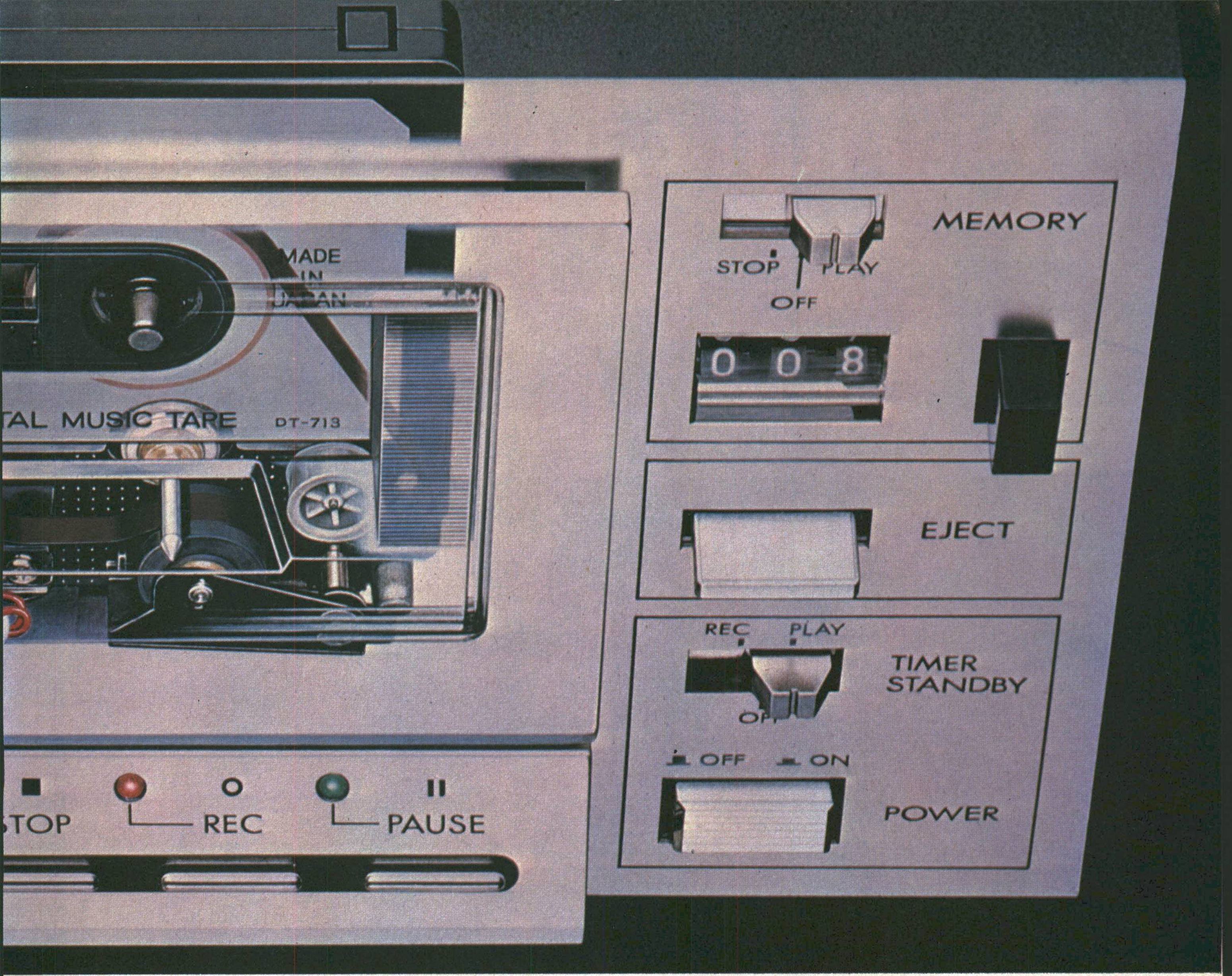
X-Cut S A Rec/Play Head.

Sendust is an ideal material for tape heads because of its superb properties.

Its maximum flux density is about 3 times higher than that of a conventional ferrite head so it will never saturate with metal tape. Now with the improved Sendust formed alloy ("Sen-Alloy") a unique contoured head has been produced (the "X Cut" version) reducing fuzziness at lower frequencies. The head offers frequency response flatter than ever across a wider frequency range.

Unique SA Complete Erasure Head.

Signals recorded on metal tape are extremely difficult to erase unless a field of a sufficiently high flux density is formed across the pole pieces in the head. A conventional ferrite erase head



al tape cassette decks.

would saturate too early. Sendust could not be used because on its own it required too much current to deliver the required flux density.

A complete range of cassette decks all with metal tape.

But now JVC have designed an erase head from Sen-Alloy with a ferrite back core giving high flux density through the pole pieces uniquely with low current. Erasure is therefore complete.

Reel to reel performance.

The figures for the top of the range KD-A8 are impressive. At–20VU with metal tape the frequency response is 20Hz to 18KHz±3dB. Signal to noise ratio with noise reduction off is 58dB. The wow and flutter is 0.135% (WRMS).

The computer does the rest.

You'd probably expect special settings for metal tape. But we've developed a micro-computer which enables the deck characteristics to *match any individual tape* on the market. We call it the Computer B.E.S.T. Tuning System. It sets bias, equalisation and sensitivity at a touch. It will detect variance among the *same kind* of tapes.

A range that's on its metal.

We're not restricting the miracle of metal tape to one top-of-the-line deck. JVC have introduced an entire range. So why not give it a fair hearing – on a JVC machine? For even more guidance about how the future sounds just fill in the coupon.

PRI

To: JVC (UK) Ltd., Eldonwall Trading
Estate, Staples Corner, 6-8 Priestley Way,
London NW2 7AF.

Please send me further guidance on metal tape cassette decks.

Name ____________________

Address ____________________

____

____

____

JVC

ANOTHER STEP CLOSER TO REALITY

JVC is the trade mark of the Victor Company of Japan

Dual hifi cassette decks

The new range of cassette decks from Dual feature the new Direct Load and Lock facility – another step forward in hifi technology.

The top model in the range, the C839RC is already acclaimed by Reviewers in this country as one of the finest cassette decks available today. Angus McKenzie reported in a comparative test of ten cassette decks in the February issue of Hi Fi for Pleasure, and we quote: "The Dual C839RC was our particular favourite since it offers such fascinating facilities."
He went on to say that this model must be very highly recommended.

BEST BUY
HI-FI CHOICE
CASSETTE DECKS & TAPES

Dual

For further information on this model and other Dual products, please contact:

Hayden Laboratories Limited
Hayden House, Churchfield Road, Chalfont St. Peter,
Bucks, SL9 9EW. Telephone: Gerrards Cross (02813) 88447

HAYDEN

DIRECT LOAD & LOCK
DLL

Soundusout

YOUR views on hi-fi, records, music, or this magazine are most welcome. A £10 record token awaits the writer of the most interesting letter and a £5 token for each other letter published.

£10

TRUE YORKSHIRE GRIT

THE letter *'Strong Stuff'* in last November's issue was actually timid.

First, dealing with power amplifiers, these are deliberately tailored and lose something along the line. For example, many manufacturers find it embarrassing to have to apply voltage to their miracle transistors, and very often fall flat on their faces in doing so. Some do add a little bit at times and the difference is obvious. Also, the output end on older amplifiers very often had a little network to improve high frequency stability which explains the ability on difficult loading not evident in some present designs.

Incidentally, about cables, I experimented fifteen years ago with different cables which makes this recent 'fad' somewhat out-dated to me, and they can affect high-frequency stability!

Now, all the rubbish put around about speakers! The belief that larger units offer better sound is pitiful. A smaller cone mass can impart better fidelity and it is not so amazing that bookshelf units perform very well. After all, the ear can be deluged in many ways, but merging sounds are obvious and the greater proportion is evident in middle frequencies. Thus it can be that fidelity overcomes bass loss.

Lastly, the front-end coupling complained about in the November item. Philip Mount's October review on the Ortofon Concorde cartridge should be re-read carefully. The comments on loading are a dream to read, if understood. I have found out for myself that 520pF loading on an Ortofon VMS20E is better than any other loading when 'tuning' the system. It is a complete folly to believe that individually-produced products can be matched by merely pushing a plug in a socket (at price). This approach can be either self-deluging or disappointing, which in a hi-fi maniac is disastrous!

However, matching can also be overdone as illustrated by another article on the same page of the November issue. The industry should be hung, drawn, and quartered for encouraging the imagination of people in a scientific field. It is absolutely ridiculous to suppose that a gold plated connector can influence the sound more than one poor soldered joint inside the unit!

The opinion about sound changes introduced by such items is not fact. The manufacturer cannot have details of the rest of this system and therefore hasn't one single fact to substantiate improvement. Tag term 'musicality' is a scientific insult encouraged by the industry to exploit the poor mind of the user working in the unknown, imaginative, variations of sound that can be deliberately conjured up.

If that letter was supposed to be 'strong stuff' then perhaps the power should be turned up. The latest transistor or circuit is such a revelation or miraculous advance it seems a pity to have to supply it with power. At least, this seems to reflect the policy in amplifier design.

The indisputable perfection projected into the mind of the intended user rarely includes positive evidence of power supply effects. In fact, the majority of amplifiers house such a barely adequate transformer and smoothing circuit, it makes one wonder how the transistor manages. The old scientific proverb 'you only get out what you put in' still holds true irrespective of persuasion that it's all because of the transistor. But then, power supplies are such an unexciting subject, aren't they?

If the sound is so unrelated to power supply why then are such dramatic efforts put into the output transformer design in the old (new!) valve amplifiers?

After all, its only a transformer isn't it? (And valve sounds are unbeatable, aren't they!) When the wonder-piece of silicon demands an electron, is it always there, on time?

The truth is that the power supply affects the sound in every way as surely as the supply of every electron.

It's no wonder there are so many amplifiers, giving a variety of sounds when so little is understood!

T. B. Smith, Mexborough, South Yorkshire

Why nine-out-of-ten for Japan?

AS A regular reader of your excellent magazine over a period of some years — I read your *'Ten Test'* of amplifiers and tuners in the October issue with great interest — and perhaps a fair touch of sadness. As a hi-fi enthusiast since 1961, my views are not by any means isolated!

Why did your *Ten Test* include *nine* Japanese amplifier/tuner combinations and one only British? Surely British or European manufacturers would have been more than pleased to co-operate with you? And just in case you think I am prejudiced, my equipment includes Japanese equipment from Aiwa and Sony.

Couldn't you have included the Armstrong 621 amplifier and 624 tuner, for instance? It certainly gives me excellent stereo radio here, sixty five miles from Sutton Coldfield with a good Antiference four-element roof aerial. Other makes could have been Quad, Sugden, Rogers, Philips, Grundig, B & O, Tandberg plus, perhaps, something from USA.

It would seem some of the answers are given between the lines in your subsequent 'controversial hi-fi questions' article.

Quite frankly, there are times when I get heartily sick of the way Oriental gear is pushed at us from all quarters and I am sure I am not alone here.

Now let's be fair and compare some of the models that I've listed.

P. C. Stilley, Warmington, Peterborough

A bad case of deja-vu!

RECENTLY I was reading a music review paper and received a shock. The particular series of reviews were about guitars and their ancillary equipment, eg, phasers and reverb' units. And the reviewers discussed them in the same manner as hi-fi journalists use for their reports. Information on ease of use, reliability, and character of sound I expected. But what floored me as a person who knew little about actual music-making was that there was such a thing as unintended distortion (as opposed to sought after distortion effects). And that whereas I had thought electrical musical instruments and their ancillaries sound-wise, differed only in having various characteristic tonal qualities they also varied in their ability to produce or reproduce the actual notes played.

What, you may ask, has this to do with hi-fi enthusiasts? Quite a lot I feel. But it concerns the person who likes to listen to *music* even more. Because it means that when you listen to sounds 'made' non-acoustically, 'fidelity' means that you hear distortion and tonal imbalance. Which will stay with us for the conceivable future despite such developments as digital recording and playback because it is inherent in the music as it is produced today.

Previously, I could never understand, despite all the explanations, why American loudspeakers were supposedly better at reproducing rock and punk music than typical British speakers. Now I think it could just be that they are better able to show the characteristics of 'non-acoustical' music. Whereas perhaps British speakers which have been evaluated on classical music simply haven't been developed the right way to do this. *Martin Howe, Bury St Edmunds, Suffolk*

Right off!

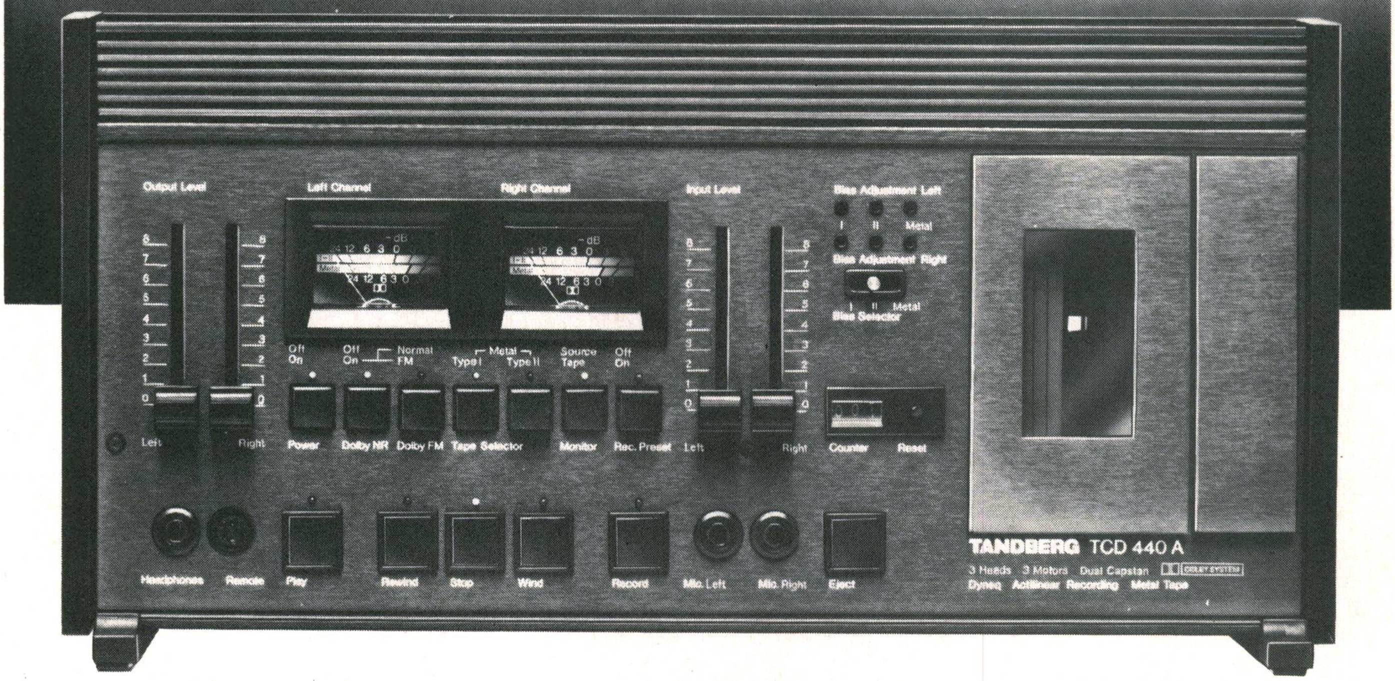
IN THIS world of technology, how is it the record companies manage to press some of their records *off centre*? It amazes me how many records I have sent back because of this fault. Some are pressed as much as a quarter of an inch out so the arm waltzes across the record. I had to send a collection of nine lps back to *'Readers Digest'* — every one pressed off-centre!

I would like to know how this happens — and if it would seriously damage my stylus.

I would like to take the opportunity in congratulating you on an excellent magazine. *D. McStein, Liverpool*

We must say that we've never found that many off-centre discs in our travels, although one classic case does come to mind of a highly sophisticated Swedish test disc, produced by their high-fidelity institute, several copies of which were presented to our leading reviewers, all suffering from this rather silly fault! We can't see that your stylus is threatened, though it will face far greater dangers than a gentle bit of to-and-froing.

WHILE YOU'RE MAKING MUSIC WE'RE MAKING HISTORY.



The search is over. At last a cassette deck with performance virtually indistinguishable from 15 ips reel to reel recording. The Tandberg TCD 440A with both 'Dyneq' and 'Actilinear' features. Available from your dealer now. Another Tandberg landmark in Hi-fi history.

For full specification and your local dealer's name write to Tandberg Ltd., 81 Kirkstall Rd., Leeds LS3 1HR. Tel: 35111.

Name ____________________

Address ____________________

____

PR F5

TANDBERG
THE EUROPEAN ALTERNATIVE

TCD 440A £599 inc VAT. Cassette Decks from £347 inc VAT. Receivers from £299 inc VAT. 2 or 4 Track Reel to Reel from £599 inc VAT.

Soundusout
continued

The DBS4 — delight . . .

CONGRATULATIONS, you have got the right taste! I had already built a system with the two SEAS units when your DBS4 came along. I have used a closed box, two-thirds filled with mineral wool and built a SEAS recommended crossover, the DO74, and I'm very pleased with the sound.

My questions are as follows: have you tested this SEAS crossover, and what are the subjective advantages of your crossover design?

Tore Hage,
Oslo 6, Norway.

Dave Berriman replies —

I HAVE not tested the SEAS crossover network which you mention and so cannot comment on either its measured or subjective performance. I suppose, being a bit independent, I prefer to design my own networks from scratch. However, the circuit which SEAS sent to me was slightly different to yours with rather different values (bass inductor 2.2mH, capacitor 8uF, if I remember correctly).

I am surprised at the one ohm resistor for the tweeter, which would suggest a brighter sound than my DBS4s. I would also expect that the impedance correction which I have applied across the tweeter would reduce the treble fizz of the H107 tweeter by comparison with the SEAS network.

. . . and damnation!

YOUR DBS4 is regressive. This is not to say that it is not a better speaker than your KEFKit transmission line. But it is probably not nearly as much better as it could be.

What's apparent from the design is that you are incapable of modern thinking. Your habits of mind more resemble those of a 19th than a 20th century man's. You value authority more than experience, and are afraid to venture very far from the comfort of ceremonies and rituals, lest you fall off the edge of the earth. Possibly this is because your experience and horizons are very limited. It is evident to intelligent readers that you have very little experience in listening to live music. And so as far as its reproduction is concerned, you know what you like, but have little basis upon which to judge quality for yourself.

As regards your adherence to familiar rituals, let me give you an example. You think one reason the DBS4 sounds less constricted than the KEFKit labyrinths is that there is more clear internal depth behind the bass-mid unit. If a little added depth has helped, have you tried adding more? Why is the DBS4 only twelve inches deep? It is mainly because you are uncomfortable with a cabinet shape that departs very far from what tradition has said betokens loudspeakerdom. It would hardly occur to you to experiment with nineteen inches, a useful depth and offering possible sonic enhancement, but costing virtually no additional usable room space. Nor would it occur to you to go to thirty inches, in a transmission-line configuration, using the useful depth of a chair — or sofa-side table. I don't believe you could envisage a fairly large speaker functioning efficiently. Tradition and authority have said it shouldn't and you are a not very inquisitive believer.

One of the reasons they've said it shouldn't is that they have declared that good speaker cabinets can be built of half-inch material. They can't. Wood of that thickness is not nearly stiff enough, nor is a layer of bitumen sufficient to damp it. Hence you have my word against Dudley Harwood's and the BBC's. On the basis of authority, it is obvious who is in error. But you can easily determine who is actually right: borrow or hire enough cabinetry glueing clamps to put all the panels of your DBS4 under fixed damping pressure, with the weight of the clamps effectively coupled additively to their mass. You will hear a difference. The BBC experiments aimed at determining a tolerable maximum of panel vibration coloration consistent with reasonable shipping weight. Why they did this, when the BBC doesn't have to ship its speakers very often, is an interesting question.

But be that as it may. The level of coloration, resulting from panel sympathy, in BBC speaker designs, can be easily (albeit ponderously) improved upon by d-i-y builders.

Your soda-straw reflex tube feature is acceptable to you since it is hallowed by tradition. One of the early apostles of hi-fi long ago took all the innovative risks. (The technique is first to be seen in Holy Writ in the September 1957, *Audiocraft,* but was used by many of these faithful previous to that). But it would not occur to you that a transmission-line might consist of many resistant small diameter tubes, or ones of small cross-sectional area, anyway. Thus perhaps could good damping be married with full sonic output. I say could — hypothesis won't do without inductive verification. You'll have to learn to experiment with a range of techniques, not just tinker with this and that convention of things, as your ostensible subjectivists do, to stumble upon something that mysteriously 'sounds good'.

The DBS4 may be a pretty nice, cheap speaker, but it is a dull, uninteresting one. Why should anybody bother with it? It resembles dozens of look-alike designs. The difference between which, in terms of fidelity to real sound, you could probably put in your eye.

John F. Withey,
Pollokshields, Glasgow.

Dave Berriman replies —

HAVING read through your overtly insulting letter I am almost at a loss for words! Without going into the minutae of your criticism, I think it's obvious that any person can concoct all manner of distinctly impractical loudspeaker designs which have little or no application in domestic surroundings. I threw out the transmission line not merely because of rear reflections but because, as I stated, by the time one damps a transmission line enclosure sufficiently to obtain a clean and well-defined bass you may as well use a smaller closed box or reflex system which inherently has fewer resonance problems.

Perhaps this touched on a raw nerve since you are a TL fan — and you've every right to be if you like the type of bass these enclosures often produce. But don't write insulting letters to me telling me how I think — you may encourage a suitably insulting reply!

I think it's obvious that having rejected the transmission-line principle, the box couldn't be made any deeper than the optimum enclosure volume for the driver would allow, and also provide a domestically-acceptable box. With regard to my transmission lines, it may shock you, and you probably won't believe me if I tell you that I had indeed thought of placing the bass unit so that it fires down the line as you describe. I had also thought of using straw-like ducts throughout a transmission-line design (and a form of resistive baffle). In fact, I have a good few more original and inventive ideas than those you mention in your letter.

It's just that a magazine project like the DBS4 has to be built by enthusiasts with ordinary skills, living in typical domestic surroundings. They often have wives who, quite reasonably, don't fancy four-foot deep loudspeakers!

Nostalgia corner

BEING one of those people who is always swopping, buying and trying equipment I thought you might be interested in a few of my observations so far.

Back in the 1960s it seemed that hi-fi was for the very few and equipment was well made without cost cutting, whereas now it's all save money here-and-there resulting in shoddy equipment. Just about everything I have tried from years ago has bettered today's in one way or another.

Quad and Radford valve amplifiers I have tried, and found only the Meridian of today to come near in terms of listening pleasure.

I used to own a pair of Goodmans speakers featuring their Midax 650 and Trebass units which cost me £60. Well, now after owning Tangent RS4, Celef Mini Pro SM and Lentek S4 speakers I still get emotional when I hear the Goodmans. Klipsch speakers from years ago together with the Quad Electrostatics still can't be beaten for listening pleasure.

I bought a Linn Sondek a couple of months back and this chap came and set it up with my Hadcock and Decca London and a week later there's this awful knocking noise coming from the motor and I have since heard of other people having trouble with these marvellous Linns.

I took it back and got a Michell Prisma which not only looks ten times better but sounds *better* as well, and when was it first designed — yes, the late 'sixties. (Transciptor Reference is similar).

I have recently bought an old Decca Professional arm and a Decca SC4E cartridge and, believe it or not, it sounds better than the Hadcock and Decca London Export combination.

I recently tried some Lucas Litz cable which sounded worse than two core mains and cost £10 for two short lengths! The sound went back into the loudspeakers and became dead sounding, but a little extra detail came through.

Finally, may I say what a great help George Hadcock has been — always willing to help with problems and supply spare parts, etc. Well done, George!

As for good old hi-fi, don't sell it — get it serviced.

C. Anderson,
Brighton, Sussex

Why no Richmond?

IN YOUR extensive survey in the December issue of loudspeakers costing around £100, I was most surprised that you omitted to include the Castle Richmond II which can, in many instances, be obtained for quite a bit less than the average figure you mention.

Whilst I fully appreciate that it is impossible to test the vast number of loudspeakers in this price range, I feel sure your panel of judges would have confirmed that the Castle Richmonds, irrespective of their superb workmanship, offer a remarkable degree of efficiency when used with amplifiers having an output as low as eight watts rms per channel. Added to this is an overall performance which, in my humble opinion, often surpasses other loudspeakers with a much higher price tag.

My view is apparently shared by those who produce the booklets, *'Hi-Fi Choice'.* They give the Richmonds a very worthy rating. Used in conjunction with my Pioneer 506 amplifier, PL514 deck and an Ortofon FF15E/II cartridge, the sound reaches a very high standard indeed for so-called budget equipment.

Finally, is it a coincidence or just sheer 'know-how' that so many fine loudspeakers seem to come from Yorkshire? Thank you for your excellent magazine.

Roy B. Hill,
Stockport, Cheshire

SHACKMAN
For crystal clear electrostatic sound

THE DYNASTATIC LOUDSPEAKER

The Dynastatic model AS7 loudspeaker incorporates not only the world famous Shackman E.S unit but also a magnificent 10″ bextrene cone bass driver. The units are housed in a superbly styled enclosure of unique and beautiful appearance. The E.S. unit radiates the sound both front and rear and is completely isolated from the bass chamber. We regard the model AS7 as the world's finest loudspeaker for sheer clarity, absence of coloration and for its unparalleled response to transients. It is the only loudspeaker which successfully combines the virtues of a perfected electrostatic mid/high frequency unit with a top quality powerful 10″ bextrene coned bass driver. You are urged to attend a demonstration of this masterpiece of sound reproduction and be convinced. The AS7's are priced at £450 the pair excl. VAT.

WE OFFER A GENEROUS ALLOWANCE FOR YOUR SPEAKERS IN PART EXCHANGE.

UPGRADE YOUR LOUDSPEAKERS IN READINESS FOR THE DIGITAL REVOLUTION

HOME CONSTRUCTORS, QUAD E.S.L. USERS AND OTHERS

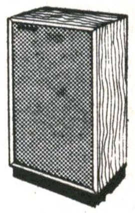
Shackman E.S. units are available either in chassis form or in acoustically transparent cabinets to incorporate in your loudspeaker system. A volume control is fitted for you to balance the sensitive E.S. unit with your woofer. The units come ready to connect to your amplifier but require woofers crossing over at 500Hz. The units are priced at £115+£17.25 the pair in chassis form or £140+£21 VAT the pair in cabinets. Suitable woofers and bass enclosures are available on request.

The Shackman E.S. unit demonstrably improves the performance of the Quad E.S.L. without having to modify the Quad unit in any way.

Quad E.S.L. users are cordially invited to attend a demonstration and check for themselves.

The Shackman E.S. unit is also suitable for use as a replacement for the B&W DM70 E.S. unit which we understand is no longer manufactured.

The Shackman E.S. unit will improve all makes of loudspeakers, just disconnect internal squawkers and tweeters and stand E.S. unit on top of the enclosure.



Leaflets
— send SAE
for full details.

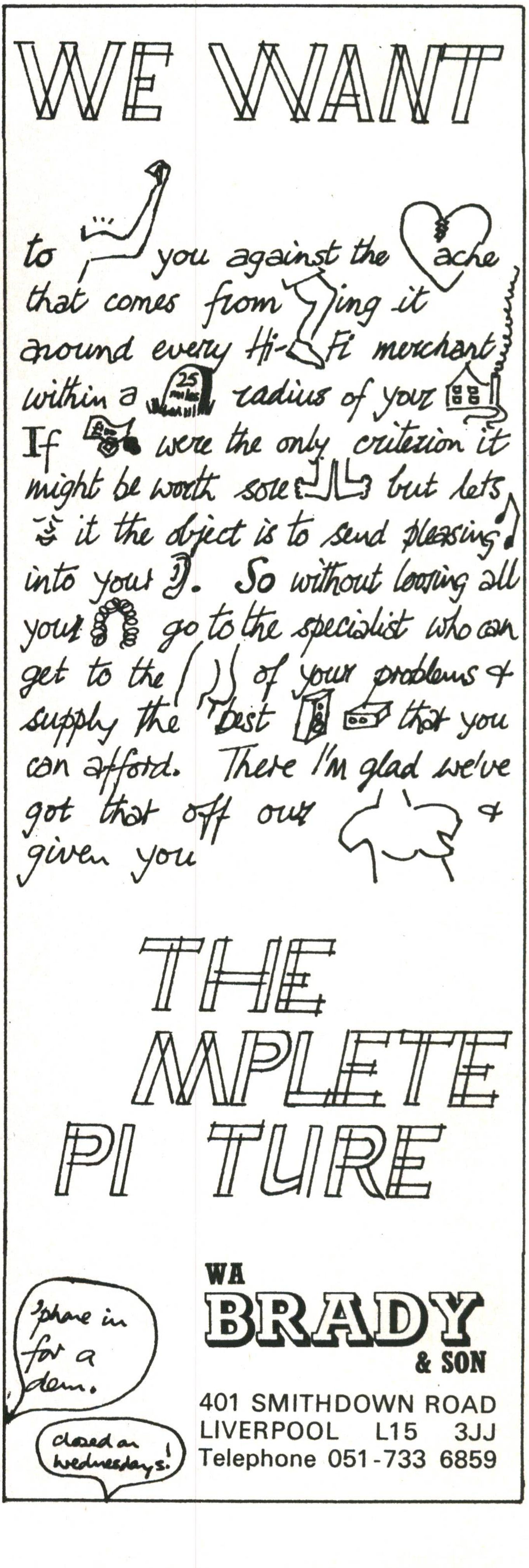
Specialist consultancy service freely available to those attending demonstrations.

AUDIO
SERVICES LIMITED

82 East Barnet Road, New Barnet, Herts. Tel: 01-449 6605
Shop hours 09.30–18.00 Monday to Saturday. Closed all day Thursday.

We offer credit facilities and accept Access and Barclaycard.

NB **Shackman speakers are also available from Wilmslow Audio, Wilmslow, Cheshire. Tel: Wilmslow 529599, and Westronics, Aller Mill Works, Kingkerswell, Newton Abbot, Devon. Tel: Kingkerswell 2666.**



WE WANT

to you against the ache
that comes from ing it
around every Hi-Fi merchant
within a radius of your
If were the only criterion it
might be worth sore but lets
it the object is to send pleasing
into your . So without loosing all
your go to the specialist who can
get to the of your problems &
supply the best that you
can afford. There I'm glad we've
got that off our &
given you

THE
MPLETE
PI TURE

WA
BRADY
& SON

401 SMITHDOWN ROAD
LIVERPOOL L15 3JJ
Telephone 051-733 6859

The first hi-fi you bought probably seduced you with its good looks.

Maybe it looked and sounded great in the showroom, but once you'd got it home and listened to it a few times, you realised it wasn't the one for you.

The honeymoon was over.

The second time around, chances are you'll be a few years older, a little wiser and, hopefully, several pounds richer.

You'll pay more attention to technical details:

Does the amplifier have a good dynamic range, 70 wpc output with 0.005% distortion and a 'Direct A'DC servo circuit?

Is the cassette deck metal compatible, with separate drive and take up motors and full logic touch controls? Does the FM/AM tuner have linear phase ceramic filters and servo lock tuning?

Is the record deck direct drive with a special turntable speed monitor and an opto-electronic end of record sensor?

Of course, none of these features are unique to System 70.

But together, coupled with Denon's 70 years experience in professional sound reproduction, they make it the perfect second choice.

Second choice.

Please send me details of Denon System 70. To: Eumig (UK) Ltd, 14 Priestley Way, London NW2 7TN.

Name______________________________

Address___________________________ PHF 7

DENON®

THE PROFESSIONAL STANDARD IN HI-FI.

QUADRAPHENIA
HI-FI CENTRE

BARCLAYCARD
VISA

10 Nursery St. Sheffield S3 8GG Tel.(0742) 77824
(MAIL ORDER BRANCH)
19 Bradford Row (Hallgate) Doncaster DN1 3NF Tel.(0302) 21215

MAIL ORDER

BY TELEPHONE: Phone in your order before 3pm for same day despatch. **BY LETTER:** Please print your name and address clearly. **CARRIAGE:** Accessories Rate 'A' 40p, Rate 'B' 65p, Rate 'C' £1.25 (includes insurance). Send 10p stamp for full list of accessories. ALL ELECTRONICS AND SPEAKERS ARE INCLUSIVE OF CARRIAGE CHARGES. **All Mail Orders to Sheffield Branch Only Please.** The prices in this advert were correct at time of preparation, but can vary from day to day. Please check the latest price by phone, you may find our latest price even cheaper.

BUSINESS HOURS: Sheffield: Mon.-Sat. 9am-5.15pm. Doncaster: Mon.-Sat. 10am-5.00pm.

SEND 10p STAMP FOR FULL LIST OF ACCESSORIES.

TUNE-UP ACCESSORIES

	Carriage & Insurance Code	Price each £
Technics electronic Stylus pressure guage	B	£17.50
Monitor Audio Pod	A	£6.75
Metrosound Clear Record Clamp	A	£4.25
G.A. Glass Mat	C	£14.90
Disk 22 Mat	C	£13.95
Lux Record Mat	B	£13.95
Michell Record Clamp	A	£8.50
AT609 Litz Headshell Wires	A	£2.50
AT610A Low Capacitance phono leads	B	£3.10
LAM Magnesium Headshells	A	£4.30
LAM Magnesium Headshells and Litz Wires	A	£7.70
HFS 75 Test Record	B	£3.90
SME S/2 Headshell	A	£5.95
SME Damper FD200	C	£20.95
Cartridge Mounting Nuts & Bolts	A	£3.00
Monitor Audio Sound Cable		
Flat 5.0m pair	C	£16.90
Flat 10.0m pair	C	£30.00
Elite Alignment Kit (Specify Arm Type)	A	£4.99
ADC LMG 1	A	£5.00
QED 79 Strand Cable		
5M Pair	C	£6.00
10M Pair	C	£12.00
Zeepa Gold 5 pin to 5 pin Din Plugs	B	£3.90
Zeepa Gold 5 pin to 4 phone plugs	B	£4.50
Zeepa Gold 5 pin to 2 phone plugs	B	£4.20
Zeepa Gold 5 pin socket to 2 phone plug	B	£3.50
Zeepa Cartridge Matchers each 100pf. 200pf. 300pf.	B	£2.70
Zeepa Carbon fibre headshell	A	£6.95
Bib Record Clamp ref. 26	B	£2.48

AUDIO TECHNICA ACCESSORIES

	Carriage & Insurance Code	Price each £
AT 1100 ARM	C	£109.00
AT-N Standard Headshell	A	£2.95
MG9 Magnesium Headshell with silver Litz wiring 9 gm	A	£10.50
MG10 Magnesium Headshell 10 gm	A	£6.70
MS10 Magnesium Headshell with Litz wiring, adjustable overhang, 10 gm	A	£9.90
LT12 Aluminium Headshell 10 gm, Litz Wiring	A	£10.40
AT605 Adjustable Audio Insulator Feet, with spirit level	B	£14.25
AT606 Heavy Duty Insulator Feet (for speakers)	B	£16.60
AT607 Stylus Cleaning Fluid	A	£1.20
AT609 Silver Litz Headshell Wires	A	£2.50
AT610A Low Capacitance Phono Leads, Gold ends	B	£3.10
AT615 Turntable Spirit Level	B	£6.20
AT618 Disc Stabilizer	C	£11.50
AT620 Gold End Phono Leads with Litz Inner Core	B	£16.50
AT6003 Tri Capsule (stores 3 headshells)	A	£4.60
AT6006 Safety Raiser (damped Arm Lift)	A	£9.90

RECORD CARE

	Carriage & Insurance Code	Price each £
Michell Universal Sweep Arm	A	£5.50
Knowin Discs Antistat	C	£16.90
Antistat Refill	B	£6.90
Soundguard Preservative Kit	B	£5.30
Soundguard Preservative Refill	B	£3.45
Soundguard Cleaner Kit	B	£4.75
Soundguard Cleaner Refill	B	£3.15
Permostat Kit	B	£4.90
Permostat Refill	B	£3.50
Zerostat Pistol	B	£6.95
Zerostat Discwasher	B	£6.90
Discwasher D3	B	£6.90
Discwasher Refill D3 6 oz.	A	£4.50
Shure Stylus Balance SF6-2	A	£5.25
Mayware Stylus Force Gauge	A	£3.45
Mayware Universal Alignment Protractor	A	£3.45
Pickering Stylus Life Timer	B	£13.00
Monitor Audio Stylift	A	£5.90
Exstatic Disc Cleaner	A	£6.00
Exstatic Sweep Arm	B	£6.95
Zeepa Sonic Magic	B	£4.99
Zeepa Sonic Magic	B	£4.99
Zeepa Clean Sweep	B	£5.90
Zeepa Disc Mask	B	£6.20
Zeepa Electronic Static Eliminator	B	£7.20

CPC ACCESSORIES

		Carriage & Insurance Code	Price each £
Pack 1	2 way speakers switching unit	B	£5.00
Pack 2	3 way speaker switching unit	B	£7.00
Pack 3	2 way phono-switching	B	£6.00
Pack 4	Mini comparator (2 amps 3 speakers	B	£8.00
Pack 5	2 way tape switching unit (DIN)	B	£9.50
Pack 6	Surroundasound (4 channel synthesizer)	B	£10.00
Pack 8	5 way mains dist unit	B	£8.90
	Plugs to suit	B	£0.85
Pack 9	Twin headphone outlet (with speaker switch)	B	£8.00
Pack 10	Cartridge Matching Unit (5 cap 5 res)	B	£7.50
Pack 11	Moving coil head amp (gold convectors)	B	£25.00

TAPE CARE

	Carriage & Insurance Code	Price each £
Ampex Cassette Head Cleaner & Demagnetizer (Cassette)	B	£3.30
Mains Tape Head Demagnetiser	B	£4.50
TDK HD-01 Tape Head Demagnetiser (Cassette)	A	£10.00
M-88 Head Cleaner Aerosol	A	£1.50
Bib Stereo Test Cassette	A	£3.50
Metrosound Dolby Tone Test Cassette	A	£2.90
Metrosound Azimuth Correction Cassette	A	£2.90
Metrosound Frequency Response Cassette	A	£11.00
Allsop 3	A	£3.50
Tape Splicer	B	£3.50
Zeepa Spray Tapehead/Stylus cleaner	B	£1.75
Zeepa Tapehead/Pinch Wheel cleaner	B	£2.90
Bib Spray & Clean ref. 58	B	£2.48
Bib Electronic Cassette Head De-Mag. ref. 23	B	£10.49
Bib VI Video Head Cleaner & Maintenance Kit	B	£9.90

CARTRIDGES

	Price each
ADC QLM 30 III	£7.90
ADC QLM 32 III	£11.90
ADC QLM 34 III	£13.90
ADC QLM 36 III	*£18.90
ADC VLM III	*£28.90
ADC XLM III	*£36.90
ADC ZLM III	*£64.00
Coral 777E	*£29.00
Coral 777Ex	£35.00
Coral MC81	*£48.87
Coral H300	£51.75
Coral T100	£24.75
Elite 300H	£14.00
Elite 400H	£23.00
Elite 500H	£45.00
Elite 555	£98.00
Glanz MFG 11T	£15*
31E	£25*
31L	£30*
51E	£39*
51L	£50*
71E	£72*
71L	£86*
Audio Technica AT30	*£30.00
Audio Technica AT14 SA	*£33.90
Signet TK 3E	£15.90
Signet TK 5E	£28.90
Signet TK7E	£55.00
Signet TK7SU	£59.90
Decca London Export	£35.90
Decca London Gold	£57.90
Grado FCE+1	£13.90
Grado F3+	*£19.90
Grado F2+	*£29.90
Grado F1+	*£39.90
Grado G1	*£64.90
Grado G2	*£109.90
Pickering 625E	*£30.00
Pickering XSV 3000	*£65.00
Pickering XSV 4000	PLEASE PHONE
Ultimo 10X	*£52.00
Ultimo 20A	*£78.00
Mayware MC-2C	£49.90
Nagaoka	SEE FULL ACCESSORY LIST
Satin 17Z	£49.90
Satin 117G	£69.90

All cartridges marked * supplied with Magnesium Headshell Free of Charge
All Cartridges are 65p P&P and insurance

QUADRAPHENIA ARE NEVER OUTPRICED!!

We will usually equal or beat any competitors published price and offer a fast, efficient Mail Order Service carriage free to U.K. mainland. This applies to speakers, cassette decks, turntables, amplifiers, etc. Accessories see carriage rates in columns.

TYPICAL PRICES

AKAI AM 2250	£69.90	VIDEOTONE MINIMAX	£44.00
AKAI AA 1200	£220.00	KEESONIC KUB	£73.00
AUDIOMASTER MLS5	£225.00	SANSUI AU217	£119.90
JVC AS5	£69.90	SANSUI SR222 II	£65.00
KEESONIC SKOUT	£174.00	SANSUI SC1300/1330	£145.90
MARANTZ SD3000	£109.90	TECHNICS SLB2	£67.50
MISSION 710	£139.00	AIWA MICRO SYSTEM	£375.00
MONITOR AUDIO MA6 II	£165.00	RAM 100	£166.00
PIONEER MINI SYSTEM	£467.00	SANSUI AU417	£189.00
VIDEOTONE BG3	£50.00	TOSHIBA PCX20	£119.00

SPECIAL CLEARANCE PRICES
(Carriage Free)

ADC SS1	£60.00
SS2	£129.90
SS3	£229.00
AIWA AA8100	£75.00
AX7400	£109.00
AKAI CS703D	£76.50
AA117S (75W)	£168.00
CAMBRIDGE L30	£120.00
INFINITY QB	£230.00
TRIO KT413	£129.00
SANSUI AU417	£189.00
SANSUI TU417	£129.00
SANSUI AU719	£250.00
TU719	£189.00
*Buy any pair above and we supply a FREE GX5 II rack	
RAM 200	£250
TOSHIBA	ALL MODELS GREATLY REDUCED
WHARFEDALE LASER 2000	£150.00
YAMAHA CA710	£129.00
YAMAHA YPB2 with GRADO FCE+1	£69.90
JVC QLA5	£102.00
OPTONICA SA3131	£150.00
OPTONICA SM3636	£129.00
TRIO KA7100	£169.00
JVC JRS301	£280.00
MORDAUNT SHORT SIGNIFIER	£475.00
MARANTZ 4025 CASSEIVER	£239.00
JVC JRS61	£99.00
AIWA AD6400	£149.00

NAGAOKA ACCESSORIES

Antistatic Record Sleeves (Pack of 5)	B	£4.50
Crystal Turntable Mat	C	£48.90
AL701 Aluminium Headshell Litz Wire	A	£7.50
AG99 Litz Headshell wires	A	£2.59
BN 7-S Cartridge nuts and bolts (Aluminium)	A	£2.50
BN 7-B Cartridge nuts and bolts (Black)	A	£2.99

RC 100 Rolling Record Cleaner	B	£6.90
RC 200 Rolling Record Cleaner	B	£9.90
CD-1 Cassette Head Cleaner and Demagnetiser	B	£2.90
H-C 800 Tape Head Fluid (Extra Strong)	B	£3.50
MP 10	B	£12.20
MP 11	B	£14.85
MP 15	B	£28.32
MP 20	B	£33.55
MP 30	B	£42.88
MP 50	B	£68.77

TURNTABLE PACKAGES

	Price each
Thorens TD 160 BC II Fitted with:—	
Mayware Formula 4 III	£149.90
Hadcock GH 228	£173.90
SME 3009 II	£168.90
SME 3009 III S	£197.90
TD 160 SUPER now available	PLEASE PHONE
Michell Focus 1 fitted with:—	
Mayware Formula 4 III	£164.90
SME 3009 II	£184.00
Audio Technica AT 1100	£248.00
JBE Series III fitted with:—	
Infinity Black Widow	£349.00
Formula 4	£299.00
3009 II	£290.00
3009 III	£340.00
A Technica AT 1100	£359.00
Sansui SR222 II fitted with:—	
Mayware formula 4 acoustically modified plus glass mat & record clamp	£130.00
Pioneer PL512 plus Grado FCE +1	£59.90

AERIALS

	Carriage & Insurance Code	Price each £
J-Beam 2 element SBI2	C	£6.90
J-Beam 3 element SBI3	C	£9.50
J-Beam 4 element SBI4	C	£12.50
J-Beam 6 element SBI6	C	£16.90
J-Beam 9 element FI95	C	£27.50

WE DIDN'T GET WHERE WE ARE TODAY JUST BY MAKING CARTRIDGES.

This is the MC20 Mk II. The latest in a long and very distinguished line of moving coil cartridges from Ortofon. But before we were experts in picking up sound, we were experts in putting it down.

In fact, we only made our first moving coil pick-up back in 1948 because we couldn't find another cartridge which did justice to the sound produced by our own cutterheads, which also used the moving coil principle.

Since then, these two lines have advanced together. And today Ortofon are the only company in the world producing both first rate pick-ups and cutterheads.

We now manufacture the more popular magnetic cartridges as well. And have revolutionised this field with developments like the Variable Magnetic Shunt (VMS).

But the absolute peak of listening pleasure is still only reached through the moving coil, with its ruler flat extended frequency response; clean, crisp transients; and three dimensional imaging. This far superior sensitivity and accuracy makes moving coil cartridges the automatic choice of professionals and serious audiophiles.

And it's to Ortofon that these specialists have traditionally looked for leadership.

In 1977 the MC20 was nominated the outstanding pick-up of the year by the Japanese Stereo Component Manufacturers Association.

Then came the MC30, which won the Japanese Grand Prix in the following year, and has been widely hailed as the finest cartridge ever made.

The major advance made by this model was the solution to a problem inherent in all previous moving coil designs. That of low compliance and resultant poor tracking ability. Ortofon's patented Wide Range Damping System, introduced by the MC30, provides damping which acts differently at high and low frequencies, giving optimum damping and accurate tracking across the entire frequency range.

Now that step forward has been incorporated into the MC20 Mk II.

It's the most recent innovation from Ortofon's laboratories. But, as the company continues its policy of investing substantial sums in research and development, it certainly won't be the last.

Read more about the MC20 Mk II in our free information pack.

Harman U.K., St. John's Rd., Tylers Green,
High Wycombe, Bucks. HP10 8HR.
Telephone: Penn (049 481) 5331.

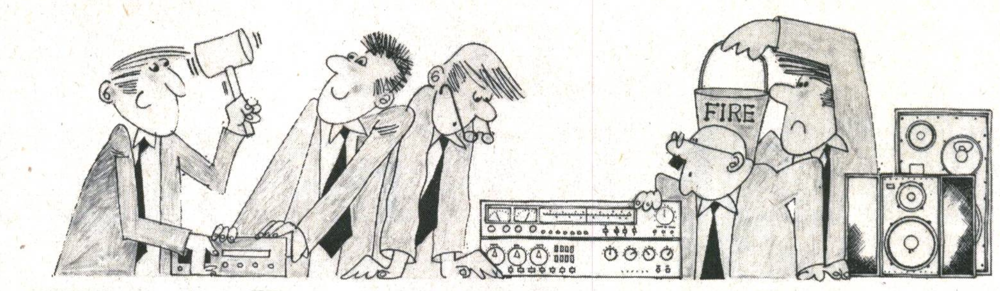
Name ________________

Address ________________

PHF 07

Post Code ________

ortofon
accuracy in sound



AUDIOCLINIC

OUR technical team answers a great many readers' hi-fi equipment problems each month, a *free* service which we are pleased to give. The most interesting letters are printed in this Audioclinic spot each month. There's no charge for the advice, though we do ask you to enclose a stamped addressed envelope for reply. Address your inquiries to: Audioclinic, PRACTICAL HI-FI, Kings Reach Tower, Stamford Street, London SE1 9LS.

FIRST-TIMER

I AM hoping to soon be making my first purchase of a basic hi-fi system and I would be very grateful of any advice you could give me on the choice of equipment.

The turntables I have considered are the Trio KD 1033B or Pioneer PL 514. Which do you recommend and what would be a suitable cartridge? Alternatively, I had thought of a Strathearn STM4 with Ortofon FF15E.

Could you recommend an amplifier in the £60-£100 price bracket? (I had thought of a Rotel RA 314 as I would find its two disc inputs very useful). Also what would be a suitable pair of speakers? I like Castle Richmonds. My tastes tend towards rock music.

Jan Boyd, London.

■ *A VERY good alternative to the PL 514 and KD 1033B is the Sansui SR 222 II and we advise you to have a listen to these and choose, as the sound quality from a turntable is an important factor.*

Suitable cartridges are Ortofon FF 15E, Ortofon F15E, AKG P6E and P7E, Grado F3 and we advise you to choose these with your speakers to get the best match of both.

At around £100 we advise you to listen to amplifiers such as Sansui AU 117, Trio KA 3700 and JVC JAS 11b. If you can afford over £100, the Sansui AU 217 is an extremely good buy.

The Castle Richmond is a good speaker but before you buy do listen to other popular favourites such as Wharfedale Linton, Audiomaster MLS1, Sanyo Hi-Fi One, AR 18, Mordaunt-Short Carnival and others.

1980-UPGRADE

AT PRESENT I have a four year old Philips N2407 stereo cassette recorder. I am thinking of replacing it with something better and have approximately £300-£350 to spend. I want to stay with cassettes if possible as I have a collection now that would be expensive to replace. I am thinking on the lines of cassette unit and amplifier as separate units, also popular makes would be preferable.

The music I play is mostly electronic rock and jazz with a smattering of classics. The room I intend setting up in is 16ft x 14ft x 8ft fully carpeted with one large window and floor length curtains. I hope you can recommend a selection of units so my final choice will be made easier.

S. Heavens, Horsham, W. Sussex.

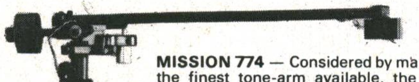
■ *WITHIN your budget, the combination of Sansui SC 2110/AU 317 is one we would most strongly recommend on account of the sound quality of the Sansui amplifier. The AU 317 is one of the few Japanese amplifiers to compete with British models. Another combination is JVC KD 25/JAS 44. After that, we would advise you to listen very carefully to other combinations in comparison with these.*

SIBILANCE

MY hi-fi system is as follows: Ditton 66s — Rotel RP 1500 — SME 3009/S2 + V15 Mk3 + Sansui AU 7700. This set-up gave a very nice sound (to my ears anyway) until a few weeks ago. The problem is sibilance which is very bad on records which before had only slight sibilance on them, and nearly as bad on the ones which previously had none. The first thing I did was replace the

Complete Audio Systems Ltd AND mission ELECTRONICS Made in England

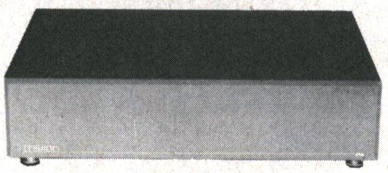
Mission in Australia



MISSION 774 — Considered by many to be the finest tone-arm available, the 774 is characterised by its elimination of free-play, flexibility and resonances. This results in maximum information-retrieval with minimum coloration. This is achieved by careful material selection, a new rigid bearing design, integral arm-tube/head-shell assembly (interchangeable), use of decoupled and damped counterweight and additional viscous dampings. The effective mass is kept to a minimum and the 774 accepts all cartridges of up to 10gm weight and 8-50 cm/Dyne (cu) compliance range. Finish black.

MISSION 773 — Medium output moving-coil cartridge. The Mission cartridge utilises new materials and advanced ideas in diamond shapes. Finish black.

SERIES II
MISSION 770 — The new 2-way "Broadcast Monitor" speaker system of a very advanced reflex design, utilising the revolutionary polypropelene cone material and BBC recommended dampings. Manufactured for the perfectionist, the 770 offers the very least coloration possible, tremendous dynamic range and phase-linearity. This exceptionally fast-acting transducer is capable of producing realism hitherto unattainable.



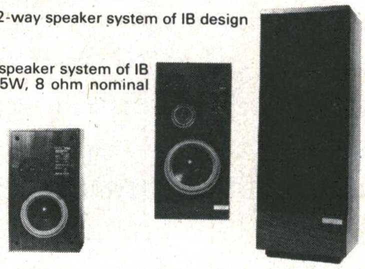
The Mission Amplifier is the outcome of a new approach to power amplifier design. The design aim was the achievement of a high degree of accuracy of reproduction virtually unaffected by differing loudspeaker loadings. The result is a close approximation to the theoretically ideal "voltage-amplifier". Unique circuitry guarantees very low harmonic and intermodulation distortions without the excessive use of negative feedback. The Mission Amplifier is constructed as two separate mono amplifiers in one case. The power-supply modules use the finest toroidal power transformers and computer grade reservoir capacitors. A separate module contains the dc-voltage offset protection circuits, thermal protection circuits, and a bank of speaker switching relays.

DOMESTIC SERIES

MISSION 710 — The well-proven compact 2-way speaker system of IB design 75W, 8 ohm nominal finished in walnut.

MISSION 720 — The acclaimed 3-way loudspeaker system of IB design recommended for use on stands. 125W, 8 ohm nominal finished in walnut.

MISSION 730 — The 730 is a 3-way reflex loudspeaker. The use of "Dynamic Damping" in the woofer allows extended and linear LF response without any ringing effects. This elegant free-standing column speaker offers a rare combination of accuracy, efficiency and high-power capabilities. 175W, 8 ohm nominal finished in walnut.



DISTRIBUTORS: COMPLETE AUDIO SYSTEMS, 175 McKEAN STREET, NORTH FITZROY, VICTORIA 3068
MAIN DEALERS: Victoria: Contemporary Sound Centre, 87 Riversdale Road, Hawthorn 3122. **N.V.:** Dale Electronics, 274 Victoria Street, Brunswick 3056. **N.S.W.:** Leisuresound Pty Limited, 401 Pacific Highway, Artarmon 2064. **S.A.:** Grenfell Plaza Hi-Fi, 25 Grenfell Street, Adelaide 5000. **W.A.:** Douglas Hi-Fi Pty Limited, 427 Murray Street, Perth 6000. **A.C.T.:** Abel Audio, Bougainville Street, Manuka 2603. **Q.L.D.:** John Gipps Hi-Fi, 12 Douglas Street, Milton 4064.

stylus. This made no difference so I then had the amplifier checked by the dealer. He found nothing wrong.

The amplifier has now been replaced by a Sansui AU 517 which has made the sibilance slightly worse.

This now leaves the speakers as the cause of my problem. I would be very grateful for your comments on what the cause might be.

A. Pearson,
Sheffield 2, Yorks.

■ *WE find it hard to believe that the sibilance in a hi-fi system can change overnight — unless you have sent the curtains to the laundry. We suspect that the main cause is vibration in the turntable and the best way to cure it is to replace the mat with the Disk 22 or Spectra Mat. To make things even better we advise you to obtain a record clamp. By clamping the record firmly on a mat which supports the record over the entire playing surface you eliminate local vibrations in the record which can reduce the clarity.*

HF PROBLEMS

I WOULD appreciate your advice on the following problems: My system is KEF Chorale speakers, Tandberg TR 200 receiver, Connoisseur BD2 turntable with M75EJ II tracking at 1.75 grammes with no trouble, room size is 15ft x 11ft x 8ft, of necessity the speakers are across a corner, standing upright on eight-inch shelves. Sounds I usually listen to are big bands, popular classics and the odd *Boney M.*

The main problem is the hf range, particularly violins, a high pitched squeak would describe it, a triangle is a piercing ring. Midrange is clear and pleasant, bass weak and requires the control to be lifted a quarter-turn to bring it up to a nice listening level, volume control is near to the half-way position normally.

For a period I tried running with the loudness control in but the bass became too much to the fore and I seem to lose clarity in midrange. HF was little different. I listen to radio quite a lot and the sound is certainly an improvement, though I still think it could be better. Reception is good considering this is a poor receiving area for stereo.

For the time being could I improve the phono with a change of cartridge.

If the Tandberg and Chorales are not compatible could you suggest some speakers around £100 to match the Tandberg.

I like the tuner section of the Tandberg, but on the other hand I liked the Chorales when I first heard them so a 'budget' receiver that would help them give of their best.

J. Dean,
Madingley, Cambridgeshire.

■ *YOUR problem of a piercing top-end is quite common. It is also quite common that this is more noticeable on disc. The cause is obviously partly due to the receiver, but changing your receiver for speakers would be quite expensive. A change of cartridge should give an improvement, but you must listen to different cartridges and choose the one which you like best.*

The Signet TK3e and TK5e are both suitable cartridges which should give a less fierce treble.

Unfortunately one of the problems of transistor equipment is the distortion of musical waveforms at high frequencies and the more high frequency output a cartridge gives, the greater distortion that results.

An improvement in your tuntable (e.g. by using a GA Audio Soundisc) will also give an improvement in the musical quality at high frequencies.

WHAT'S BEST?

MY SYSTEM consists of Trio KR 3600 receiver, Trio KD 1033 turntable and a pair of Celestion Ditton 15XR loudspeakers. I also have two cartridges: Ortofon F15E MkII and a Shure M95 EJ. Personally I find that the Ortofon sounds better than the Shure M95 EJ.

However, as I read in your magazine that suitable cartridges for KD 1033 are the Shure M75ED or Empire 2000E/III, I would like to know which cartridge you think is better to connect to my turntable including the above mentioned Shure M95 EJ or Ortofon F15E MkII and others? I usually listen to classical music.

I also would appreciate your comments on whether my system would be improved in the case of replacing the Trio KD 1033 for a Trio KD 2055?

Jose Ferreira Moreira,
Lisbon, Portugal.

■ *HAVING carried out listening tests between the Trio KD 1033B and KD 2055, we would say the KD 2055 represents a worthwhile improvement in sound as a result of the very heavy rigid ARCB base. The platter is the weak point on the KD 2055 but this can be improved by use of a mat.*

An ADC LMG 1 headshell is an improvement. The Ortofon VMS 20E in an ADC LMG 1 headshell gives very good results in the Trio KD 2055, but good results are obtained with far more other cartridges than you would normally expect.

Our current recommendations for use with the KD 1033B are Grado F3 or F1, mounted in an ADC headshell of course.

GETTING IT TAPED

I HAVE a very annoying problem with my Sanyo RD 5500 cassette deck. Occasionally the tape slows down for a few seconds and then resorts to its normal speed. This happens during both recording and playback. It occurs using either pre-recorded cassettes or while I am making my own recordings. I know the tapes I use are not at fault, and I also keep the heads etc of the machine clean.

I have already taken the machine to a dealer who can find no fault.

J. Nevin,
Galway, Eire.

■ *THE only logical assumption we can make as to the cause of your cassette deck slowing down, is that a wire in the motor circuit is not firmly connected and momentarily loses contact. Alternatively it could be that a part is overheating or that the motor bearings could need oiling.*

TOP TAPE

CASSETTES

EUROPE'S TAPE SPECIALIST

FUJI FX·II 90

Sony

CHF	
C60	59p
C90	82p
C120	£1.09
BHF	
C60	79p
C90	96p
C120	£1.17
AHF	
C60	92p
C90	£1.15
ALPHA	
C60	£1.24
C90	£1.59
FeCr	
C60	£1.34
C90	£1.79

TDK

DYNAMIC	
C46	62p
C60	69p*
C90	89p*
C120	£1.25
C180	£2.99
ACOUSTIC DYNAMIC	
C60	99p
C90	£1.29*
C120	£1.79
OPTIMUM DYNAMIC	
C60	£1.12
C90	£1.59
SUPER AVILYN	
C60	£1.23
C90	£1.75
METAL ALLOY	
C60	£3.35

******Check availability of recent offer at even lower prices.*

Video

		mins	
VHS – *Super Avilyn*			
TDK	E60	60	£6.29
	E120	120	£8.49
	E180	180	£9.79
BETAMAX			
SONY	L125	30	£4.89
	L250	65	£5.45
	L370	90	£5.99
	L500	130	£6.75
	L750	195	£8.89

Video – *other brands normally available at very competitive prices.*

Bargain Beaters

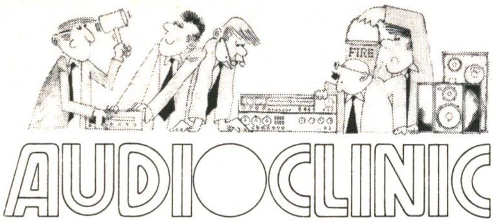
FUJI		
FX-I	C60	85p
	C90	£1.09
FX-II	C60	99p
	C90	£1.35
MAXELL		
UL	C90	79p
UD	C90	£1.05
UDXL I	C90	£1.39
UDXL II	C90	£1.65

Wholesale and Export

Enquiries to: TOP TAPE, 27 Springfield Road,
Harrow, Middx Tel: 01-861 0601

MAIL ORDER to: **TOP TAPE, 27 Springfield Road, Harrow, Middx.**
Tel: 01-861 0601. Postage 45p – Orders over £15 POST FREE.
Prices include VAT at 15%
JULY 1980.

LONDON EC4 53 Fleet Street	01-353 7935
NW6 190 West End Lane	794 7848
SW3 305 Kings Road	351 0200
SW13 145 Church Road, Barnes	748 5484
W1 48 Wigmore Street	486 8262
ABERDEEN 441 Holburn Street	25713
ALDERSHOT 81 High Street	20728
BASINGSTOKE 2 Newmarket Square	22157
BATH at Harpers Furnishing, London Road	316197
BEDFORD 21 Tavistock Street	56323
BELFAST 71 Chichester Street	40644
BOURNEMOUTH 10 Gervis Place	25512
BRADFORD Fotosonic House, Rawson Square	22972
BRISTOL 52 Gloucester Road	422709
BROADSTAIRS 78 High Street	0843 61587
CAMBRIDGE 1 Hawthorn Way, Chesterton	312120
CROYDON 89 London Road	01-686 1343
DARLINGTON 76a Skinnergate	61922
DARWEN 219 Duckworth Street	75201
DONCASTER 19 Bradford Row	21215
EASTBOURNE 4 Albert Parade, Green Street	31336
EDINBURGH 52 George Street	031-226 3979
EGHAM 172 High Street	5036
ENFIELD 191 Chase Side	01-363 7981
EXETER 76 South Street	73309
GLASGOW G2 221 St. Vincent Street	221 2527
GLOUCESTER 15 Worcester Street	419777
GRIMSBY 71 Cartergate	43539
HARROW 340 Station Road	01-863 8690
HINCKLEY Unit 3, Castle Street	611541
HITCHIN 106 Bancroft	52248
ILFORD 442 Cranbrook Rd., Gants Hill	01-518 0915
KINGS LYNN 53 Norfolk Street	64111
LEICESTER 26 Melton Road	668267
LICHFIELD 52 Bakers Lane	23025
LIVERPOOL 105 St. John's Precinct.	709 0388
MANCHESTER 4 119 Oldham Street	832 7710
MANCHESTER 14 162 Wilmslow Road	224 4215
MIDDLESBROUGH 118 Borough Road	217166
NEWCASTLE upon TYNE 33 Handyside Arcade	27791
NORWICH 22 St. John, Maddermarket	60801
NOTTINGHAM 156 Alfreton Road	76919
OXFORD 256 Banbury Road	53072
READING 130 The Butts Centre	56363
SHEFFIELD 101a Ecclesall Road	23365
SOUTHAMPTON 421 Shirley Road	772069
STEVENAGE 23 Queensway	55336
STOCKTON 81 High Street	69995
SWINDON 60 Fleet Street	38222
UXBRIDGE 278 High Street	33474
WATFORD 101 St. Albans Road	45250
WEYMOUTH 29 Walpole Street	785729
WOKING 27 Chobham Road	4667
WORCESTER 43 Friar Street	25740
YEOVIL 3 Princes Street	25430



HARDENING OF ATTITUDES

CONCERNING your reply regarding the Shure V15/111 loading (*Audioclinic*, December) you may find the following of interest. (Unfortunately, having given up hi-fi for the past twelve months I no longer have the relevant cuttings for the following, which are taken from memory).

1 — Re.33k/low capacitance loading I remember Angus McKenzie recommended this in *Hi-Fi For Pleasure*, under *Reviewing Reviewed*. However, he later (*via* a reply to a letter of mine in *Hi-Fi Answers*) stated that he agreed with Shure's recommendation — the hardness he attributed to arm resonance.

2 — Another *Hi-Fi For Pleasure* article by Martin Colloms (?) under '*Vertical Tracking Angle Explained*' (I think that was the title) attributed the hardness of the Shure V15/111 and quite a few other cartridges to an excessively high vertical tracking angle.

My own experience with two V15/111 styli partly bear out Martin Colloms' remarks, though I found that room temperature has to be taken into account as well, as the V15 does not like cold rooms — just altering the vertical tracking angle on a 'cold' cartridge had no effect. Using my original two-year old stylus I found the further the stylus retracted into the body the more neutral the performance, though bass became somewhat soft. This decrease in tracking angle was achieved automatically, due no doubt to the age of the stylus assembly. The second stylus, being brand new, was as 'edgy' as the first one was when that was new. It never achieved the neutrality of the first stylus because: a) — I didn't keep it long enough; b) — it wouldn't retract as far into the cartridge body as the older stylus. (Tracking weight was kept the same for both asemblies). I did try the effect of altering my SME's height but, as Martin Colloms pointed out in his article, this only alters matters by a degree or two and is not really sufficient to bring about the desired result.

Finally, an interesting experiment to assess the performance of various cartridges/arms/arm height combinations is to extract the different signal (vertical information) by connecting a third high quality loudspeaker across the left and right positive loudspeaker terminals only — the results are interesting, to say the least!

G. J. Barlow,
Malvern Link, Worcestershire

■ *WE must admit to have largely given up moving-magnet cartridges for enjoying music. They tend to sound shallow and thin, with a top-end fizz. This fizz is a by-product of deliberately induced mechanical resonance which keeps up the hf response, and in order to control the peak, extra capacitance is often added and this also brings up the upper mid-band to flatten the response. It's these engineering fiddles which also result in 'hardness' in many m-m cartridges in our opinion.*

Moving-coils have an inherently better electrical response and hence need no mechanical peaking. With one or two exceptions, none need added capacitance either. As you rightly say, vertical tracking angle is critical and temperature influences the sound of many cartridges.

TAPE TEASERS

THOUGH I am very interested in hi-fi equipment in general, I find it very hard to follow test results, etc. Please could you give me information such as whether comparatively low or high signal-to-noise results are good, etc?

I would also like to know which normal bias tapes give the best quality and performance for their price? I, myself, use Memorex MRX3 and CrO_2 but was considering a change to Maxell UDXL1 or TDK OD or SA — any comments? My equipment is extremely 'primitive' so I find your magazine most informative as to more advanced hi-fi systems.

Miss L. Nicholson,
Turriff, Scotland

PS: To settle an argument could you tell me whether the use of a tape head cleaner or chrome-dioxide tape on normal position, will be harmful to my equipment in any way?

■ *UNDERSTANDING hi-fi test results can be a little confusing initially but you will gradually begin to comprehend them we're sure. The signal-to-noise ratio you frequently see detailed is a measure of the level of a genuine signal put through an amplifier, for instance, and the level of inherent noise the amplifier produces itself, so the greater the ratio the better. Signal-to-noise ratios are generally expressed in decibels (dB) so if you see a signal-to-noise ratio quoted of 70dB or —70dB for a disc input of an amplifier, this means that the level of inherent electronic noise produced by the amplifier itself is 70dB lower in level than a signal fed in. If the ratio was, for instance, only 55dB or 60dB it would mean that during quiet passages of music, 'noise', usually in the form of hiss, would probably be audible from the speakers. The higher the dB figure as regards signal-to-noise ratios, the better. Hope that helps a bit.*

As for differences produced by tapes, we always find that experimentation is best. Most of the current well known tapes are excellent but the sound quality, will depend on the cassette deck itself to a large degree. If you find that Memorex gives you the

LET YOUR DEALER GUIDE, LET YOUR EARS DECIDE

We, along with a host of other Hi-Fi. dealers I'm sure, are forever being asked, "Which is best, A or B?" Ninety-nine times out of a hundred the answer is "Neither!"

For instance: REGA v. DUAL: GRADO v GLANZ A+R v SANSUI: TANGENT v MISSION: etc. etc.

You could assemble a system from any of those component parts that will look good, and be as reliable as any. But when it comes to sound, it is a dangerous thing to say "It will sound good." To some, it will, to others it won't! This is the Hi-Fi. game, and of course the term HIFI. means different things to different people. Hi-Fi. no longer means "The Closest approach to Live Sound", it now means "The Sound That Suits Me".

And, indeed, why shouldn't it? After all, it's your money. You are entitled to buy with your money the HiFi system that suits you. And the hell to what others may think!

Which is where we come in. We have our favourites of course, but are not bigoted enough to insist that it is what you should have. If it's on our shelves, you have our guarantee that it is recommended, but the final choice is yours. We will guide to the best of our ability, but in the end, it's your decision.

Remember, both "Cox's Orange" and "Golden Delicious" are apples..........

Reading Cassette & Hi-Fi Centre

5 & 6 HARRIS ARCADE, FRIAR ST., READING, BERKS. TEL: (0734) 585463
HOURS OF BUSINESS 9.30 am to 5.30 pm TUES-SAT. LUNCH 2 pm-3 pm Except Sat. Closed on Monday
ACCESS — BARCLAYCARD — TERMS AVAILABLE — MAIL ORDER — EXPORT — PART EXCHANGE

best results with your cassette deck, then stick to it, but by all means experiment with other makes as you might well find something you prefer even more, and also experiment with different bias and equalisation settings.

Now for your argument! Keeping tape heads, guides and capstans thoroughly clean is necessary, and it is for this reason that professional recording studios and broadcasting authorities regularly clean their tape decks every morning. Mind you they get more use than our decks do, but cleanliness is essential. The tape head cleaners in cassette form are, in our view, not as good as doing the job by hand using a proper tape head cleaning fluid, or Isopropyl alcohol purchased from a chemist, using cotton buds. By dipping the buds into the cleaning fluid and carefully going over the heads, guides and capstan, including the pinch roller, one should proceed until there's no trace of residue oxide visible on the buds. So keeping the deck clean can only be good and certainly not harmful — it's not cleaning that's harmful. If you use a chrome tape in the normal (ferric) position, or a ferric tape in the chrome position it will only vary the frequency response when recording and playing back, it can in no way damage your cassette player!

SHOULD I CHANGE?

FOR some time I have been thinking of buying a tuner or a tuner/amplifier. For the last six years or so I have used an Armstrong 521 but it has malfunctioned more than once. One channel deteriorated and then went completely. It then developed a persistent hum on the same channel which intruded into the quiet passages of music. Sending the amplifier back to Armstrong and having one of the local dealers look at it has not solved anything really. As far as I can see the malfunctions only happen on the audio part of the amplifier. All this is very irritating, because the quality of reproduction is very high. The filters work very well indeed and everything else seems to function normally.

Because of the nature of the house I live in I find it more convenient to use a pair of headphones and the advice I would like is, do you think I should persist with the present equipment and add a tuner and which sort of tuner, or should I get rid of the amplifier and buy a new amplifier and add a tuner later or should I go the whole way and buy a receiver? I know that buying these things is a personal matter, but I would like your neutral and expert opinion on this as I know so little about the technicalities of tuners and receivers. Moneywise, I want to pay up to about £100-£120 for tuner, £130-£150 for amplifier and about the same for receiver.

D. R. Wild, Bradford

■ *It is up to you whether to buy a receiver or separates. Generally at low price levels a receiver gives better value. However, £270 will buy you an A&R A60 amplifier and a Trio KT5500 or similar quality tuner. The same money spent on a receiver would give you a Sansui G301 or G401 receiver (recommended for sound quality) and quite a bit left over or a choice of the very scarce Nytech CTA 252XD11 or the Harman Kardon 340 receivers. We do advise you to visit a good hi-fi dealer and to make your choice by careful listening.*

SCHOOLBOY BUDGET

I AM intending spending something like £200 to £235 discount at the end of the summer, as long as I do have a summer job. The thing is, I am still at school, so can only earn during school recessions.

I want a new hi-fi system and I need a large chunk of your advice as I am still a bit of a novice at this thing.

It is difficult for me to travel as I am stuck away in the tip of Fife and it is costly to travel about too much, so you now know why, to some extent, I am relying on you.

My first idea was either the Pioneer PL512 or PL514 deck, the Pioneer SA506 amplifier and Solavox PR45 loudspeakers (Amstrad EX350). What cartridge I don't know. This seems to me a good choice, having heard the Pioneer PL112D, a Pioneer receiver and Solavox in operation. It sounded a very healthy system indeed but unfortunately, I do not know the codes for the receiver or loudspeakers.

I then thought about getting a direct-drive turntable, a Strathearn STM4, the above Pioneer amplifier, but more efficient loudspeakers, and an Ortofon cartridge.

Now, after looking through some old hi-fi magazines, I saw in a Comet advertisement, the following set-up: Trio KA3700 amplifier, Trio KD1033B deck and Goodmans RB20 loudspeakers. The cartridge was an Audio-Technica AT13EA. Very promising I thought, and could well be within the budget.

I now feel, however, I should go for something a little more modest; perhaps the Pioneer PL512 deck, a suitable cartridge, Solavox PR45s and one of the Amstrad 2X20 - 2X25 amplifiers. Would this latter system go together, or do you think the former Trio-Goodmans-Audio-Technica would be better for me? (To be honest with you, the former I like best). Do you think I should go back to Pioneer?

With the Trio set-up, will the Goodmans RB20s be a good match? And as a last request, what system do you personally suggest for the price range?

I know what is said about this idea of "now, remember, it is your ears that are the final test . . ." But it is difficult for me to travel, especially when I sit my examinations in a few weeks and work during the summer.

The size of the room is 14 x 14.5 feet so 25 watts rms will be OK, won't it?

J. Kennedy, Coral, Fife.

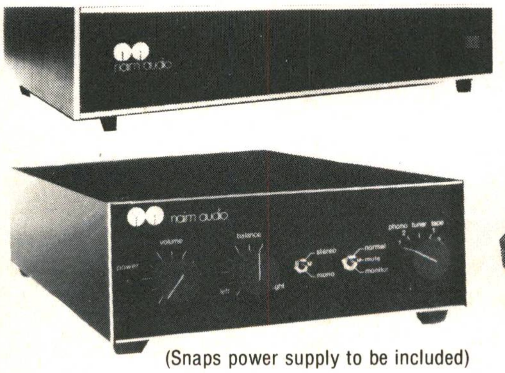
■ *Reading your letter thoroughly, we get the impression that you are choosing equipment in entirely the wrong way. Looking at the discount prices and guessing which products to buy is even worse than choosing from the reviews in hi-fi magazines. The best way is by listening for yourself at a good hi-fi shop. The more we compare systems, the more we find that the best system at any price is the one with the best turntable. We suggest you go and have a listen to a Dual 504. If this is impossible our recommended system would be: Dual CS504 turntable, Sansui AU117 amplifier and Videotone Minimax 2 or Wharfedale Shelton loudspeakers.*

Rayleigh Hi-Fi

THE Specialists

THE PERFECT COMBINATION

NAIM NAP250, NAC32

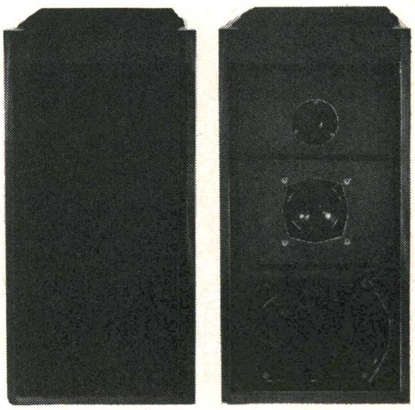


(Snaps power supply to be included)

LINN SONDEK LP12

Suggested combinations with the LP2
Grace 707 arm + Supex SD900 cartridge.
Linn Ittok arm with Asak cartridge.
Syrinx PU2 arm with Asak cartridge.

LINN ISOBARIK 'DMS' SPEAKERS



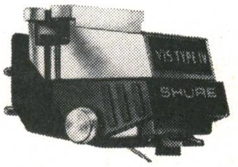
All items on Demonstration and Normally in Stock

AKG, A&R, Asak, B&W, Celef, Chartwell, Coral, Denon, Diesis, Dunlop System Deck, Entre, Exposure, Formula 4, Grace, Grado, Hadcock, ITTOK, JR, Lentek, Linn, Meridian, Mission, Naim Audio, Nightingale, Nytech, Ortofon, Quad, Rega, Rogers, SME, Spendor, STD, Sugden, Supex, Swallow, Syrinx, Technics, Tresham Audio, Ultimo, Videotone.

44A High Street, Rayleigh, Essex
ACCESS, BARCLAYCARD — Full Credit Facilities

Tel: Rayleigh (0268) 779762
3 years parts & labour guarantee on Hi-Fi Systems

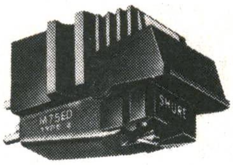
fact: there's a Shure cartridge that's correct for your system —and your cheque-book:



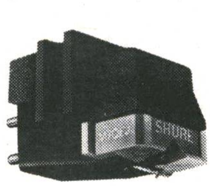
V15 Type IV—The perfectionist's pickup—overcomes such ever-present problems as warp, static electricity, and dust. Ultra-flat response. Reduced distortion. Unprecedented trackability. ¾ to 1¼ grams tracking. Premium-priced.

M97HE—The top model from an entire new line of Shure pickup cartridges, each with the exclusive Dynamic Stabilizer and the unique SIDE-GUARD stylus protection system, and available in a range of stylus tips, tracking forces, and prices. The M97HE features the distortion-reducing Hyperelliptical stylus. ¾ to 1¼ grams tracking.

M95HE—New mid-priced cartridge with distortion-reducing Hyperelliptical stylus. Flat response. ¾ to 1½ grams tracking.



M75ED Type 2—Deluxe cartridge with a nude-mounted Biradial (Elliptical) stylus for outstanding high frequency trackability. ¾ to 1½ grams tracking. Overall performance previously unavailable at this price level.



M70 Series—Modestly priced cartridges with truly noteworthy performance. 1½ to 3 grams tracking. Biradial or Spherical styli.

fact: the pickup cartridge is the heart of hi-fi . . .

The hi-fi pickup cartridge functions as the *source of sound* (the point at which the recording is linked with the balance of the hi-fi system)—therefore, its role in high fidelity is absolutely critical. Just as the camera can be no better than its lens, not even the finest hi-fi system in the world can transcend the limitations of an inferior cartridge. The cartridge represents a relatively modest investment which can audibly upgrade the sound of your entire record playback system.

Consult with your nearby Shure dealer who will help you select the Shure pickup cartridge that is correct for your system and your cheque-book. We especially recommend that you audition the Shure V15 Type IV. Discriminating critics throughout the world praise this cartridge as the new standard for faithful sound re-creation. It overcomes such ever-present problems as dust, static electricity, "hot" signals, and record warp that cause "clicks" or "pops," and distorted record reproduction. May we send you our brochure?

®SHURE®

Shure Electronics Limited, Eccleston Road, Maidstone ME15 6AU
Telephone: Maidstone (0622) 59881

In the Hi-Fi jungle, there's a system that doesn't speak with forked tongue.

Choosing a Hi-Fi system should be fun. But for the unwary, it can be like stepping into a jungle. A jungle where everything is not always as it seems. Systems may have apparently impressive technical specifications. But if such specifications are regarded as an end in themselves the sound you hear can still be coloured, harsh and, ultimately tiresome. You hear music the way the system dictates, rather than the way the musicians intended.

We at Pye believe that there is only one way to build sound reproduction equipment, and that is to get as close as it is humanly and electronically possible to ensuring that you hear the music the way it was originally played.

The Pye Hi-Fi Sound Project system HF3035 stands out in the Hi-Fi jungle as one that speaks to you with straight tongue. It has a 35 watts per channel amplifier with less than 0.08% THD. An advanced cassette deck with Dolby B® System. An electronically controlled semi-automatic turntable with wow and flutter better than 0.09% WRMS, complete with cartridge. And a pair of high performance bass reflex 2-way speakers.

The elegant housing furniture is designed to ensure domestic harmony with its smooth teak finish, cassette drawer, recessed turntable shelf, and smoked glass door shutting off the record compartment.

Pye speaks to you with straight tongue in more ways than one. The price of the complete HF3035 system is only around £475. Famous Pye reliability is built in and you will be backed by our nationwide service network, in the unlikely event of your ever needing it.

Pye's promise to you is – 'The finest audio equipment of its class you can buy.'

PYE HI-FI SOUND PROJECT

You can rely on Pye

PYE LTD, 137 DITTON WALK, CAMBRIDGE CB5 8QD.

® Dolby is a registered trade mark of Dolby Laboratories Inc.

High-Fi

"For the first time Grundig have come up with products that are very well priced and can compete in the same market as the Japanese."

This remark could well be taken from a press release or publicity handout from Grundig. And, certainly, it does sum up the stance we'll be taking in the eighties.

The interesting point about it is that it doesn't come from Grundig at all.

It's an opinion expressed by Gerry Grey of G.D.S. Hi-Fi in Nuneaton. He's a self-confessed enthusiast who has been in the Hi-Fi business for some years. His enthusiasm (although tinged with a trace of cynicism due to our performance in the past) is understandable. And he's not alone either. At a recent trade showing, the Mini System was greeted with unqualified enthusiasm.

The example you see here comprises four units. Typical selling prices, including VAT are shown in brackets. Taken from the top we have the MT 100 Tuner (£150), the MXV 100 Pre-Amplifier (£127), the MCF 600 Metal Cassette Deck (£270) and the MA 100 Power Amplifier (£150).

(360mm).

The tuner has seven FM presets with variable muting that enables distant stations to be brought in without FM hiss, while AFC, too, locks onto a station and excludes drift. Also integral to the design is Grundig's Tunoscope tuning system and a 12 element LED based signal strength meter.

The pre-amp has a signal-to-noise ratio better than 75dB. Distortion at 1kHz is less than 0.005%. It utilises class A circuitry and has other features often missing from units of this size.

Twin outputs mean that two power amplifiers may be driven simultaneously. Twin tape sockets facilitate the easy connection of two independent tape decks. Phono sensitivity is switchable to enable matching of sound levels with different sources.

Naturally, the cassette deck is biased for metal tape, while the new 'High Com' noise reduction system gives a signal-to-noise ratio that, at 79dB, is a clear 14dB improvement over a typical Dolby cassette deck. It has Microswitches for all motor functions, quartz locked capstan drive, variable bias and extremely accurate LED level meters.

Finally, there's the power amplifier. It delivers 50 Watts RMS into 4 ohms with a Total Harmonic Distortion of less than 0.01% at 1kHz. The power output is monitored by a twin LED display that can be switched to monitor over the full display range at lower listening levels.

The overall height of the unit is, as you may have guessed, 360mm.

To conclude we'll go back to Gerry Grey in Nuneaton:

".....Up until now Grundig have been a product unto their own.....People either liked it or disliked it and that was that.....Now with their new product, people will think again.....If Grundig have the same sound reproduction as they have with the bigger stuff they are onto a winner....."

As far as reproduction is concerned we know we've surpassed anything we have done in the past. We also know that now we are onto a winner.

GRUNDIG

Grundig International Limited, Newlands Park, London SE26 5NQ.

If QUAD amplifiers are so perfect, why does it still sound better in the concert hall?

In real life, the sounds from all the instruments and sometimes parts thereof are independently radiated and so are not 'phase locked' together nor are they subjected to common eigentones.

These mutually incoherent wavefronts are subjected to tiny but important reflections at the pinna and finally end up as just two channels representing the pressure at the two ear drums. It is not possible to achieve this transfer accurately by means of loud-speakers or headphones however good these components may be.

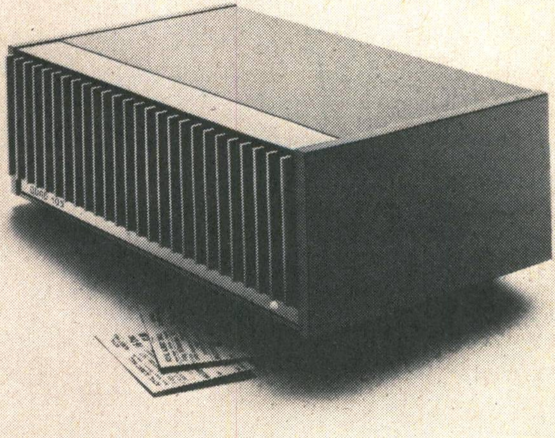
Nevertheless with good amplifiers and loudspeakers (and on those occasions when the people at the recording and transmitting end get it right) a musical experience can be achieved which is extremely satisfying and one of the greatest pleasures of our time.

For further details on the full range of QUAD products write to: The Acoustical Manufacturing Co. Ltd., Huntingdon, Cambs. PE18 7DB.
Tel: (0480) 52561

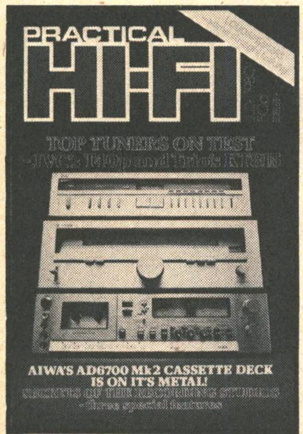
QUAD

for the closest approach to the original sound

QUAD *is a Registered Trade Mark*



things we hear


PRACTICAL HI-FI
TOP TUNERS ON TEST
AIWA'S AD6700 Mk2 CASSETTE DECK IS ON IT'S METAL!
SECRETS OF THE RECORDING STUDIOS
- three special features

THIS month, we're testing two top tuners — the JVC T40P and the Trio KT815. Also, there's a special report on Aiwa's AD6700 metal cassette deck. If you like secrets and you're interested in recording studios, you can have the best of both worlds as Practical Hi-Fi *goes behind the scenes and finds out what happens when producer and engineer start employing special effects equipment. Additionally, we're giving you some straight talking on loudspeakers and there are plenty of regular features.*

PRACTICAL HI-FI

PETER HERRING	Editor
JULIA PEARSALL	Editorial Secretary
DAVE BERRIMAN T. Eng. (CEI), MIPRE	Technical Editor
COLIN RICHES	News/Production Editor
GEOFF GILES	Editorial Consultant
CARL ANTHONY	Editorial Consultant
LAURIE SHRIMPTON	Assistant Editor (Art & Production)
RON CUNNINGTON	Editorial Artist
VIC PIERI	Advertisement Manager
GRAHAM HARVEY	Assistant Advertisement Manager
SIMON WALWORTH	Advertisement Representative

© IPC Magazines Limited 1980 Copyright in all drawings, photographs and articles published in PRACTICAL HI-FI is fully protected, and reproduction or imitations in whole or in part are expressly forbidden. All reasonable precautions are taken by PRACTICAL HI-FI to ensure that the advice and data given to readers are reliable. We cannot, however, guarantee it, and we cannot accept legal responsibility for it. Prices are those current as we go to press. All correspondence intended for the Editor should be addressed to King's Reach Tower, Stamford Street, London SE1 9LS. Tel: 01-261 6833 or 01-261 6686. Queries must be accompanied by a stamped addressed envelope. Address correspondence regarding advertisements to Advertisement Manager, PRACTICAL HI-FI, King's Reach Tower, Stamford Street, London SE1 9LS. Telephone 01-261 6727. For classified advertisements — 23rd Floor, King's Reach Tower, Stamford Street, London SE1 9LS. Telephone 01-261 5000.

WHEN THE MUSIC STOPS...

JUST in case you ever imagined that we were somehow spared the usual frustrations and tribulations of trying to get sound out of two loudspeakers, a story to warm the heart of anyone who's had that unforgettable experience of singeing the eyebrows with a soldering iron while scratching the head in utter bewilderment. A balmy April evening, Mozart's last piano concerto, the beguiling B flat K595, filling the room. All was well, until the start of the second movement. The spell was abruptly broken by an ominous buzz from the right: I knew it in from afore, and the spirits sank. Sure enough, the reassuring orange glow from an output valve had turned a ghastly, lurid yellow, and the usual aroma of lightly-grilled dust had been overwhelmed by something altogether nastier.

Once all had been switched off, I examined the offending bottle. It didn't actually *look* burnt out, so maybe it was just a sudden surge or something, in which case . . . Out came the mains fuse — or what remained of it — and I hastened off to find a replacement.

Now, you don't need me to tell you that the first thing to do when a fuse goes, not just with hi-fi gear but with anything, is switch off the juice and discover exactly what caused it to blow. God knows, we must have printed that advice many times in this organ alone, so what a pity its impatient and incautious Editor doesn't have the sense to heed it! Oh no, I just replaced the fuse, switched on again, watched all the valve heaters resume their usual golden aura, and smiled smugly. Except that on advancing the volume control, there was not the merest murmur of Mozart from the right hand speaker.

Now the fun starts. Has something happened to the pre-amplifier, or the lead, or the loudspeaker? Has the valve expired, come to that have both right channel valves died on me? It's at this point that my fairly limited technical knowledge terminates and blind improvisation takes over. On a previous occasion I had discovered it was possible, if not especially advisable, to obtain sound from either channel with just one of its output valves in operation. So the suspected 'dud' was removed — but to no avail. Then followed a haphazard interchanging of valves and leads, all of which only went to prove that the fault was indeed in the power amplifier. The new mains fuse, needless to say, remained completely inviolate throughout all this.

At this point, you may be thinking, 'serves him right for using antique equipment anyway', but I regret there is more. One 'perk' of this job is that you can at least keep a few spares around for just such an emergency, and I was able to dust off another power amplifier — a reputable transistor design. This was 'substituted' in the system, as they say — and how easily that word flies off the tongue! The actuality is very different. Not only does the fresh amplifier require a totally different, and apparently unique, signal output lead from its predecessor, it also requires alterations to the loudspeaker leads; and once you've done that you have, of course, forgotten which side was live and which was screen because you never did get round to wrapping a bit of red tape round the former, and anyway why can't the makers mark one of the wires differently from the other in the first place . . .

You get it sorted out, but your troubles have only just begun. It turns out that the second amplifier is duff on the right channel as well. Well, 'duff' hardly describes it. After working for a few minutes, a coarse, rushing noise begins. This inevitably provokes the customary prodding of the connections, (the normal spontaneous reaction of any hi-fi user to such an incident) whereupon the noise becomes a deafening scream that sends the cat bolting from the room in panic and has the wife white with hysteria. Attempts to laugh it off as 'just one of those things' are insufficient appeasement, especially when, as you confidently turn on again proclaiming that the fault will have cleared, the self-same shriek emerges.

At these times, it is best to quietly and carefully tidy away the bits of wire and strands of copper, the numerous tools and blobs of solder that litter the carpet and retire into a corner to ponder on the injustices of life.

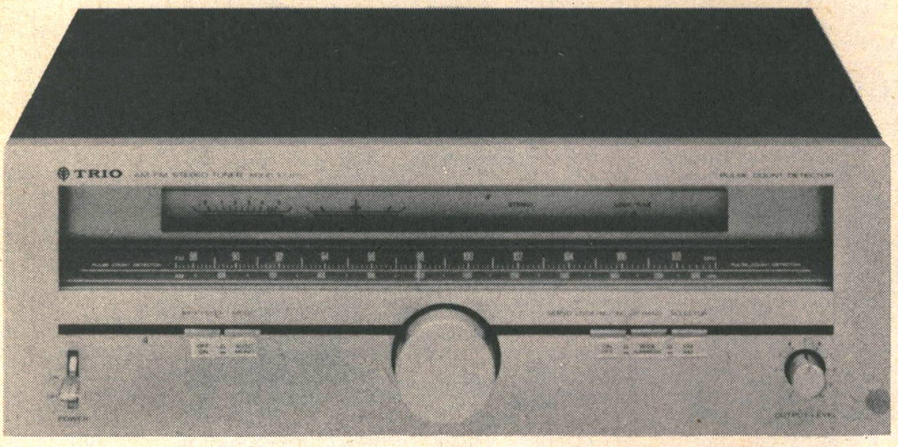
But tomorrow is another day, and even if you've now destroyed two power amplifiers, why there's yet another that can be lugged home from the magazine's storeroom. Of course, it is only when you have got it home that you discover there is not one solitary lead in the box and that again with the usual peversity beloved of amplifier designers, a completely non-standard signal connection has been employed. It's probably detailed in the instruction book for all I know but, needless to say, that too has vanished.

The thing also employs one of those new-fangled mains connectors (something else to blame on the EEC) but, as luck would have it, one is already employed on our coffee percolator. It is duly spirited away with much lauding of the virtues of the instant variety. Sadly, though, the aforementioned signal lead defies all attempts to find the right pins on an eventually rather sorry-looking DIN connector. A couple of other plugs are similarly butchered, and the entire arrangement of those miles of leads that lurk behind the equipment is destroyed in futile efforts to come up with some method that will produce anything resembling stereophonic sound. I make a mental note to write some piece or other lambasting manufacturers for never agreeing a true international standard for audio equipment connections: moreover, I note, the next reviewer who helps himself to a lead before returning the equipment sample, will be lovingly throttled with that accursed self-same bit of wire.

So I speak to you surrounded by defunct amplifiers and a veritable snake pit of multi-coloured leads and strands of copper. And, at least for the foreseeable future, to quote Hamlet — the rest is silence.

Peter Herring

AUDIOLAB REPORT



TRIO KT815 PULSE COUNTING TUNER

BY GORDON KING

I REVIEWED Trio's new 'fast' breed amplifier in the July 1979 issue, and this review shows what the Trio boffins are doing to make fm reception even better. There are various ways by which fm signals can be detected to reclaim the programme material from the vht carrier-wave, but some produce more distortion than others.

A good scheme which is capable of very low distortion, and one which Trio seems to have 'rediscovered', is pulse-count detection. This is certainly not new and is almost as old as fm itself. You can see references to it in the first edition of my *FM Radio Servicing Handbook* (Newnes-Butterworths) on pages 57 and 125, and this was first published way back in 1957!

Moreover, Trio is not the first manufacturer to adopt this kind of detection commercially in the UK for it was used by Pye in their *'Black Box'* series of 'hi-fi' in the early 'fifties! Of course, with modern fast-switching devices some of the problems faced by the early designers are now resolved, and the KT815 employs a very much up-dated circuit, but the basic principles remain. These are explained both in the *FM Radio Servicing Handbook* and in my recent book called *Radio Circuits Explained* (also by Newnes-Butterworths), pp 65-66, which was first published in 1977.

From first principles, the fm signal in the intermediate frequency (i.f.) stage of the receiver is first rectified so that the lower half-cycles are clipped and then the resulting pulses are converted to quasi-square-waves. Now, because the frequency of an fm signal is continuously deviating about the mean frequency in concord with the programme material the spaces between the pulse also change in sympathy. These pulses are fed to an integrating circuit whose output corresponds to the mean value of the pulse chain. When there is no modulation the pulses are evenly spaced so that the output is 'zero', but when there is modulation the mean value of the pulse chain follows the modulation pattern, so that the integrating circuit output corresponds to the audio modulation, which is then passed to the audio frequency (a.f.) stages of the tuner.

At the standard 10.7MHz fm i.f., the pulses occur too quickly for accurate 'counting', and so it is necessary to employ a lower i.f. (intermediate-frequency). In the early days an i.f. as low as 250kHz was used, but with the faster switching capability of latter-day transistors and ICs (integrated circuits) a higher i.f. can be utilised. The Trio opts for 1.96MHz. To use this i.f. exclusively would be bad for selectivity and spurious responses, so to combat these things so-called double conversion is adopted. This merely means that the vhf signal is first converted to the standard fm i.f. of 10.7MHz, bandpass amplified at that frequency to provide most of the selectivity, and then converted to the low i.f. of 1.96MHz for application to the pulse-count detector.

The tuner also incorporates switchable wide and narrow i.f. bandwidth. In the former mode the total distortion is incredibly low, even at full modulation, the lab results showing a mere 0.07 per cent harmonic in stereo mode and no more than 0.14 per cent intermodulation in the same mode. At full modulation I would say that these are pretty well the lowest distortion figures that could be achieved with any tuner — lower, in fact, than the distortion on the transmitted signals themselves!

Of course, in the narrow bandwidth mode a higher distortion must be expected owing to the higher-order fm sidebands being attenuated by the narrow filtering. For 30dB signal/interference ratio on a wanted signal of only 100µV, a 50mV (50,000µV) unwanted signal needs to be a little over 400kHz away in the wide mode and around 300kHz away in the narrow mode, though the lab results reveal a little asymmetry of response.

I was also pleased to find that the pilot tone and 38kHz sub-carrier components were well down below full modulation level. This is achieved by a unique circuit which actually subtracts the pilot tone from the audio signal, yet despite this deep attenuation the frequency response is maintained to 16kHz as shown by *Fig 2* pen-chart graph. There was a trifle more low-frequency roll-off than experienced on some other tuners, but this is not very important.

The pulse-count type of fm detector also endows the tuner with a remarkably good noise performance, and it is one of the quietest tuners that I have had the pleasure of testing, particularly in mono mode, where a ratio as high as 80dB (CCIR/ARM) was measured. The ratio was less on stereo even with the mpx filter on.

The curves in *Fig 1* give an overall impression of the limiting, sensitivity and mono/stereo noise of the tuner from an aerial input starting at 1µV and going up to more than 2,000µV. These show that the limiting occurs at very low signal inputs and that the absolute sensitivity of the tuner is very high. The signal to noise ratios of mono or stereo can be discovered for any aerial input

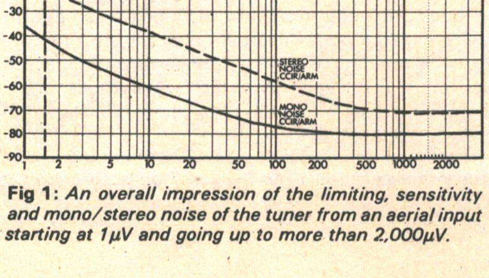


Fig 1: *An overall impression of the limiting, sensitivity and mono/stereo noise of the tuner from an aerial input starting at 1µV and going up to more than 2,000µV.*

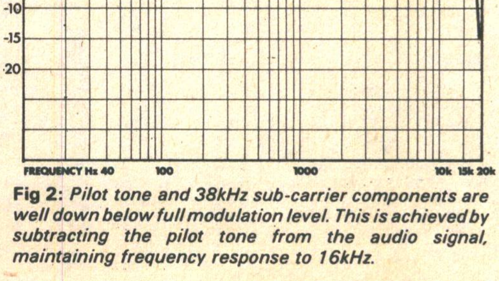


Fig 2: *Pilot tone and 38kHz sub-carrier components are well down below full modulation level. This is achieved by subtracting the pilot tone from the audio signal, maintaining frequency response to 16kHz.*

by measuring the dB distance between the upper curve and the lower mono or stereo curve. The values for ratios of 30 and 50dB are also given in the lab chart. At the 75ohm aerial input a little mismatch was detected, standing waves on the correctly terminated feeder resulting is shifts in absolute sensitivity.

The rf intermodulation was not the same on each third-order sideband. I obtained a better rejection at 96MHz than at 93MHz when using a two-tone input signal of 94 and 95 MHz. At 76dB on the upper sideband the result is quite acceptable, but I would have been happier with a similar ratio on the lower sideband. On the other hand, the repeat spot suppression at 98dB was very good

Stereo separation was excellent at all audio frequencies of interest, being better in the wide than narrow bandpass mode as would be expected, of course.

The tuner is equipped with two front meters, a centre-zero for accurate fm tuning and another which indicates relative signal strength; but our tests showed that this saturated far too early — reading full-scale on quite weak signals, which is a pity. There is also a 'touch-action servo-lock' tuning arrangement, whereby any tuning error is automatically corrected when the hand is removed from the tuning control knob. The lock-on condition can be defeated by a front button, which also removes the muting between stations. A small light glows when the lock-on condition occurs. Other features include a front output level control, buttons for mono/stereo and mpx filtering, and mw am taking signal from a rear ferrite rod aerial.

Since the lab tests I have been using the tuner under domestic conditions to assess its performance subjectively and to see how well it pulls in stations. Using master-tape programme material modulated on a vhf stereo carrier and with the tuner set aside to the wide selectivity mode I obtained reproduction well up to the very highest standard that I have so far obtained from any fm tuner. It is also sensitive enough to respond quite acceptably to weak mono and stereo signals. In very strong signal areas, though, it may be prudent to ensure its suitability by a home trial.

In conclusion, then, a very well designed tuner which makes a fitting partner for the KA701 amplifier.

TEST RESULTS

Input signal for: 30dB S/N mono: 50dB S/N mono/stereo: -1dB limiting:	 0.8μV 3.5μV/40μV 0.8μV
Input/audio output curves:	Fig.1
S/N 1mV input mono/stereo:	80dB/71dB
RFIM 93MHz/96MHz:	70/76dB (≈73dB average)
Repeat spot ratio (half IF):	98dB
Capture ratio:	≈1dB
Selectivity (100μV/50mV):	+448kHz/-412kHz; +259kHz/-323(n)
Tuning error 95MHz:	-77kHz
Distortion 1kHz harmonic: IM stereo 9kHz with 19kHz pilot:	 0.05%m/0.07%s; 0.25%m/0.5%(N) 0.14%; 0.5%(N)
AM rejection ratio (30%AM):	56dB
Pilot reject. ratio ref. 1kHz:	80dB
38kHz spuriae ratio ref. 1kHz:	80dB
Stereo separation including harmonics and spuriae:	100Hz 54dB/1kHz 58dB/10kHz 60dB 37/43/45dB ditto (N)
Frequency response:	Fig. 2
Output:	0-1.3V var.; 800mV fixed

Approximate retail price: £285 inc VAT

B. H. Morris & Co (Radio) Limited, Precision Centre,
Heather Park Drive, Wembley, Middlesex HA0 1SU.

Notes: Tested at 75ohm aerial input and in wide selectivity mode except where stated otherwise. Reference modulation 100%. All S/N and interference ratios CCIR/ARM weighted

Lab work by Gordon J. King (Enterprises) Limited, Brixham, Devon.

SUPER
summer
SALE

ENDS JULY 31ST. !!

TURNTABLES

MICRO SEIKI	
DD24	**£84**
MB14	**£64**
MB10	**£58**
PHILLIPS	
677	**£69**
777	**£84**
TEAC	
Px500	**£124**
Px300	**£79**
ADC	
1600DD	**£89**
1700DQ	**£109**
AKAI	
AP100C	**£62**
AP206	**£84**
AP306	**£129**
AP307	**£53**

AMPLIFIERS

ROTEL	
RA300 (2x20W)	**£58**
RA350 (2x35W)	**£78**
RA1000 (2x40W)	**£108**
RA714 (2x50W)	**£127**
AKAI	
AM2250 (2x25W)	**£75**
AM2350 (2x35W)	**£89**
AM2650 (2x65W)	**£165**
HARMAN/KARDON	
HK503	**£176**
HK505	**£239**
JVC	
JAS11	**£78**
JAS22	**£99**

HI-FI RACK UNITS

AKAI PRO100	**£449 (inc spkrs)**
AKAI PRO200	**£485 (spkrs extra)**
ROTEL 4000 system	**£449 (inc spkrs)**
Philips 590	**£369 (inc spkrs)**
Philips 594	**£429 (spkrs extra)**
Ferguson system 15	**£295 (inc spkrs)**

MUSIC CENTRES

Philips	**£129 (inc spkrs)**
Akai	**£279 (inc spkrs)**
Murphy MS3200 guaranteed 4 years	**£75 (inc spkrs)**
Ferguson Studio 12	**£159 (inc spkrs)**
Ferguson Studio 20	**£169 (inc spkrs)**
Ferguson Studio 40	**£219 (inc spkrs)**

RECEIVERS

AKAI	
AA1125 (2x25W)	**£105**
AA1135 (2x35W)	**£129**
AA1150 (2x50W)	**£145**
AA1175 (2x75W)	**£169**
AA1200 (2x120W)	**£199**
JVC	
JRS201L	**£185**
HARMAN/KARDON	
HK340	**£160**
HK560	**£179**

SOUND SHAPERS (EQUALIZERS)

ADC SS 1	**£59**
ADC SS 2	**£149**
ADC SS 3	**£209**
ROTEL	
RE700	**£67**
RE2000	**£176**
TEAC GE20	**£169**

SPEAKERS (PAIR)

WHARFDALE	
Chevin	**£33**
Denton	**£53**
Shelton	**£59.95**
Linton	**£79**
Glendale	**£114**
Laser 200	**£159**
E30	**£189**
E50	**£289**
E90	**£489**
TANNOY	
T125 Oxfords	**£175**
Cheviot MK2	**£419**
Ardens	**£499**

CASSETTE DECKS

AKAI	
CS703D	**£79**
GXC704	**£115**
GXC706	**£133**
GXN31 Metal	**£149**
TEAC	
A108 Sync	**£179**
A430	**£239**
A109	**£99**
A107	**£126**
A300	**£159**
A510	**£159**
HARMAN/KARDON	
HK1500	**£165**
HK2500	**£195**
HK3500	**£289**

OPEN REEL

TEAC X10R	**£449**
TEAC X10	**£409**
AKAI GX635D	**£536**
AKAI 4000D	**£198**

VIDEO PRERECORDED FILMS
From **£17.95**

VIDEO RECORDERS

AKAI	**£579**
AKAI Remote	**£659**
Ferguson	**£569**
Mitsubishi Remote Control	**POA**

VHS TAPES

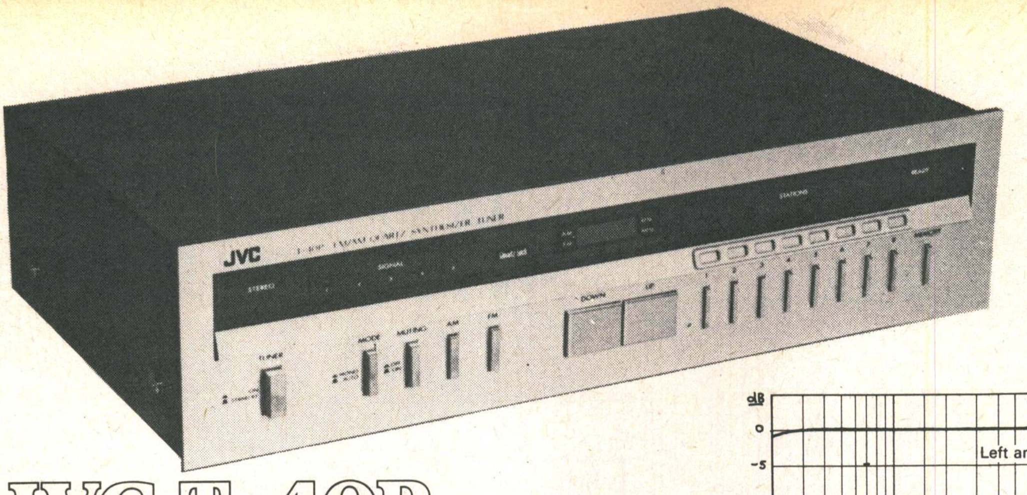
E120	**£8.95**
E180	**£9.95**

SPECIAL OFFER ON ONE AKAI RACK SYSTEM TO SAVE £££'s
RING NOW WHILST STOCKS LAST . . .

tel: 01 650 4701

S M ELECTRONICS

68 CROYDON ROAD
ELMERS END
BECKENHAM
KENT



JVC T-40P QUARTZ DIGITAL TUNER

by GORDON KING

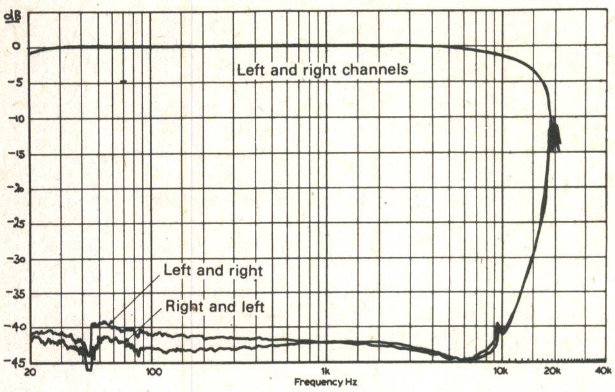


Fig 1: Frequency response and separation, showing left and right speaking channels and breakthrough on the right and left channels. Modulation level 20 per cent at 1kHz, tests made with 50µs pre-emphasis. Output loading high impedance to simulate radio input of amplifier.

THIS recent release by JVC applies a "new look" to Japanese tuners in that the tuning system is totally devoid of things mechanical. Although there are quite a few European and American tuners based on digital tuning in one form or another, the technique to date is relatively sparse Oriental-wise. Instead of the conventional ganged mechanical capacitor, tuning scale and cursor, invariably operated by a large, flywheel assisted knob, the T-40P is equipped with a small front panel window displaying the tuned fm and am (mw only) frequency in brightly illuminated digits and press buttons to provide the up or down frequency change.

There are two modes of digital tuning, one where the tuning is continuously variable, and the other where the tuning works in small "jumps" of frequency. The T-40P is of the latter mode. A quartz crystal-controlled oscillator provides a very accurate reference frequency and from this all the small intervals of frequency are provided by "digital" electronics. This is called synthesised tuning because the local oscillator and hence the tuned frequency are derived from a synthesised signal. This mode has the great advantage that once the frequency is locked to the quartz crystal reference frequency there can be no front-end tuning drift; also the frequency shown by the digits is the true frequency of the transmission.

A possible disadvantage is that if the frequency of the required station is slightly different from the tuning step frequency that stations can never be tuned one-hundred per cent accurately. However, JVC have overcome this by arranging for the locking frequencies to be at intervals of 50kHz, which is also the ultimate fm readout definition. As most fm stations are spaced at integral multiples of 100kHz all those stations will thus be tuned accurately; as also will those of 50kHz multiples. There is only the odd station, such as Wenvoe Radio 4, which deviates from this example. Wenvoe, for example, runs at 92.125MHz, so to receive this one would tune to 92.15MHz, causing a tuning error of 25kHz, which is really small enough to be ignored.

The frequency steps for mw am are 1kHz over the range 531 to 1,602kHz. The fm range is 87.55 to 108MHz.

Press-key tuning

The fm or am band is selected by the depression of the appropriate push-key, which is the "light touch" type. The band is shown by an illuminated dot on the digital display moving to the MHz or kHz mark and, of course, by the change in digits.

There are two press-keys for tuning, one for upward increases and the other for downward decreases. By depressing either key once the frequency changes by one digit (*eg* 50kHz fm or 1kHz am). However, when either key is held in the depressed condition the tuning changes very rapidly up or down after about 0.05 seconds am or one second fm.

Probably a big advantage of the tuner from the user's point of view will be that up to eight stations can be memorised and recalled by the depression of the appropriate button. The programming is simple. One merely tunes to the station as already described, then depresses a button labelled "memory" which causes a small memory-ready light to glow for about two seconds and then, while the light is glowing, to depress the button with which it is required later to recall that station. Such presetting can be done on both fm and am.

The tuning data is retained by an internal electronic memory which is energised from the mains supply or, for about two days, from an internal supply. In continuous use the tuner would be switched on and off by a front standby switch. This keeps the memory active and the internal memory supply charged. The mains input can be switched off, however, by a rear master switch but then, as already noted, the memory fades after about two days and the press-buttons have to be re-programmed.

Beneath a darkened window strip along the top of the fascia are several lights which provide information on the signal. There is the usual stereo light which comes on when a stereo transmission is tuned; a row of five red-glowing leds for indicating signal strength; and finally a brighter light which switches on when the quartz lock condition obtains. The signal strength leds are numbered one to five, and the number of lights lit is a measure of relative signal strength up to a limited signal level, after which all the lights glow.

There are press keys for mode and muting. The first changes a stereo signal to a mono one (the stereo light extinguishing when this happens), and the second mutes all signals below an internally preset level. However, with our sample the muting occurred automatically, regardless of the setting of the muting switch, whenever the tuned frequency was changing. This is probably to avoid the spurious signals (spuriae) generated by the synthesising from being heard while the tuning is taking place; but, frankly, I found it somewhat frustrating because to locate a station of unknown frequency one needs to release the tuning key after each digital change in order to hear whether a station is present or not on that frequency! Of course, if you know the frequency of the station you require then you would go straight to it on the digits and the muting would be of no consequence to you. But when exploring the band, especially mw, it would be good if the muting could be lifted while the frequency was changing.

For am there is a rear ferrite rod aerial which hinges up and down but cannot be rotated, while for fm there are 300-ohm balanced and 75-ohm coaxial aerial inputs, the latter *via* an inverted type of coaxial socket, calling for the use of a converter (what's wrong with the conventional coaxial socket?).

The audio signals are delivered by rear phono sockets. There is no lever control, but the signal level delivered would be suitable for the vast majority of hi-fi amplifiers at the tuner input. There is also a rear socket for accepting a remote control unit.

The lab results reveal a tuner

of outstanding fm sensitivity and good mono signal-to-noise ratio, but the stereo signal-to-noise ratio was less good. It was found to have an encouragingly high immunity against unwanted stations and was not particularly prone to the generation of spurious signals in areas of high signal strength. A very acceptable RFIM rejection ratio of 74.5dB was measured (average), and I was pleased to note that the rejection was similar on both the third-order IM sidebands.

Although the spec places the stereo distortion at 0.3 per cent I was unable to measure better than 0.5 per cent harmonic and one per cent total intermodulation on my sample. Better results were obtained, as would be expected, in the mono mode.

Pilot tone and subcarrier spuriae were well down, and the am rejection ratio was around average, though a precise measure of this is not easy to obtain.

The pen-chart graph in *Fig 1* shows that the frequency responses of both left and right channels were remarkably well matched, but that the upper-frequency roll-off started a trifle early at just before 10kHz. Stereo separation over the entire spectrum was excellent.

Under audition the tuner gave good quality sound on well engineered fm transmissions; using lab-derived vhf fm stereo signals with master tape modulation, the ultimate quality was judged to be a shade below that which I have recently obtained from other tuners, notably the Trio KT815, which I am now hoping to establish as a "reference". I must stress, however, that such detailed subjective evaluation demands the employment of the highest possible quality programme signals, and cannot be done from off-air transmissions.

In the standby mode a slight trace of buzz could be heard emanating from the tuner, possibly from the mains transformer; but, again, this could have been a characteristic of the test sample.

In summary, then, an interesting state-of-art tuner which, while not reaching the pinnacle in fm quality, would be of interest to many enthusiasts, especially in view of its 50kHz synthesised digital tuning and press-button station selection.

JVC T-40P tuner test results

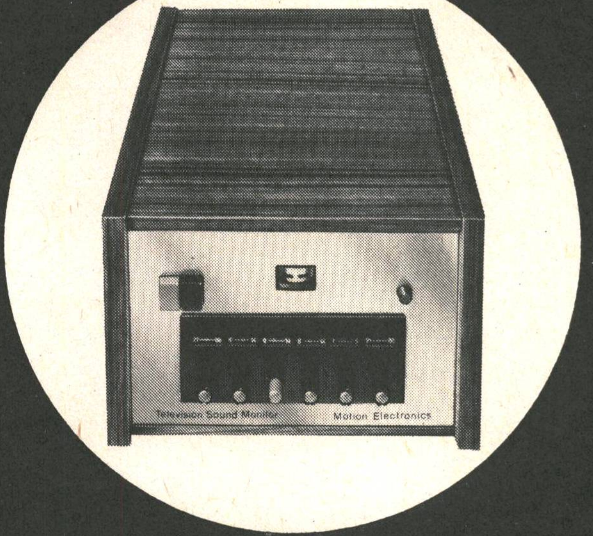
Parameters	Results
Input (75 ohms) for 30dB mono S/N ratio: 50dB S/N ratio mono/stereo: −1dB limiting:	 1μV 3.2μV/32μV 1.2μV
S/N ratio 1mV input mono/stereo:	75dB/72dB
RFIM 94MHz/95MHz input (two-tone) at 93MHz: at 96MHz:	 75dB 74dB
Repeat spot suppression ratio:	88dB
Capture ratio:	≈1.5dB
Selectivity 100μV/50mV ref. 95MHz:	+335kHz/−385kHz
Distortion 1kHz harmonic mono/stereo: Intermodulation:	 0.12%/0.5% 1% stereo all products
Pilot tone rejection:	66dB
Stereo subcarrier rejection:	68dB including spuriae
AM rejection ratio (30% AM):	45dB
Frequency response/separation:	Fig. 1
Output into high impedance:	630mV
Typical selling price	£205 inc VAT

Manufacturer/distributor:
JVC (UK) Ltd, Eldonwall Trading Estate, Staples Corner,
6-8 Priestley Way, London NW2 7AF.

Notes:
Aerial input is the voltage across the matched load. Modulation level 100 per cent except for am. Noise weighting CCIR/ARM.

Lab work by Gordon J. King (Enterprises) Limited Laboratories, Brixham, Devon.

Television Sound at its very best



The Television Sound Monitor is a complete F.M. tuner capable of reproducing high quality sound from television broadcasts. OPERATING INDEPENDENTLY OF A T.V. RECEIVER, its only requirements are a simple aerial and mains supply. The audio outputs can be fed directly into any high fidelity amplifier or tape recorder. V.H.F. radio with stereo facilities can be incorporated as an option. Designed and manufactured in England, the Television Sound Monitor will operate in any country regardless of frequency or type of modulation — A.M. or F.M. Utilising the latest electronic tuning it has proved its reliability in television studios, relay networks, schools and Hi-Fi homes throughout the world.

- ● Instant Press button station selection.
- ● Capable of reproducing high quality sound from any television system in the world.
- ● Available in four versions: — UHF only; VHF only; UHF/VHF and UHF/VHF radio/stereo
- ● In Teak veneered cabinet or chassis only.
- ● Unconditional two year guarantee.

MOTION ELECTRONICS LIMITED

Wisteria House, Tonbridge Road, Wateringbury, Maidstone, Kent.
Telephone: Maidstone (0622) 812814

A postage stamp for your reply would be gratefully received.
Please send details of the Television Sound Monitor to

NAME ....

ADDRESS ....

....

....

Telephone number.......... PHA

AUDIOLAB REPORT

AUDIO PRO TPA150 PRE- A4-14 ACTIVE LOUDSPEAKERS

THIS is a system comprising an integrated tuner /control amplifier and a pair of speakers integrated with their own power amplifiers. The plan is for the low-level output from the TPA-150 to drive, *via* a length of suitable cable, the power amplifiers in the speakers and hence the speakers themselves. The Model A4-14 speakers are known as 'Ace-Bass Biamplified' and they have much in common with the design philosophy adopted by Audio-Pro in their Model B2-50 'Subwoofers'.

It is not a bad idea to arrange for the power amplifiers to be close to the speakers. For one thing it ensures that the drivers 'see' maximum damping from the low output source impedance of the amplifiers, which is not possible when the speakers are driven from a more distant power amplifier through fairly long tracts of cable. For another it makes it possible to use active filtering and separate amplifiers for the bass and midrange drivers, which is the technique used by Audio-Pro and which will be exposed later.

The TPA-150 is virtually the same as the TA-150 receiver but without the power amplifier section of the latter. Although using digital readout of frequency and microprocessor control, the tuner is not of true frequency synthesised design. With that sort of tuner the frequency is caused to change in small steps of 100kHz or 50kHz on fm when the tuning facility is operated. With the TPA-150 the tuning is contunuously variable from about 86.0MHz to 108.6MHz fm and from about 512kHz to 1634kHz mw am. The frequency display has four red-glowing digits of easily-visible size which show the 12-hour time of day when the receiver lies in standby mode and when it is switched to sources other than radio.

Because the power amplifiers can be regarded as part of the speakers they were not disconnected internally and tested separately. This would have been an unfair assessment of their potential. Instead they were evaluated as integral units by 'ears' and sound pressure level meters when being driven by the TPA-150. The TPA-150, however, was subjected to my usual lab scrutiny and, of course, applied to auditioning and to domestic hi-fi service to give you as much information as possible on its in-system performance and operating characteristics. Let us, then, start by examining the TPA-150.

TPA-150 receiver/control amplifier

THE all-black appearance endows it with the characteristic 'European' look, which is very much favoured by some people though possibly equally disliked by other people! Personally, I find that a black finish tends more easily to blend in with the furnishings in my listening room than the sparkling 'silver' finish of some of the Oriental presentations.

One of the first things that will be noticed is that the fascia is equipped with only one fairly large diameter control knob which is free to rotate unchecked in either direction over soft 'click' positions. This solitary knob, in fact, operates all the primary controls of the tuner and control amplifier. In the position which would normally be occupied by the tuning scale of a conventional receiver is a row of sixteen light emitting diodes (leds) which show red against a scale calibrated from −16dB, through zero to +16dB.

The role played by the knob is determined by a vertical column of six soft-touch press buttons, labelled volume, balance, bass, midrange, treble and tuning. The button depressed is revealed by the glowing of a red led adjacent to it. If the volume button is depressed a clockwise rotation of the control causes a conventional increase in volume by an amount revealed by the sequential lighting of the scale leds, the scale starting in this case at infinity or maximum attenuation (zero output).

If the balance button is depressed, operation of the control knob shifts the glowing led along the scale to the left or right depending on the direction of rotation. The 'neutral' or balanced condition is then obtained when the leds directly either side of the centre 0dB on the scale are glowing. Exactly the same sort of indication prevails when the bass, midrange or treble tone control button is depressed, the scale then showing the dB amount of lift output.

If the tuning button is depressed when the receiver is switched to a source other than radio, the knob can be used to set the clock, anticlockwise motion setting the hours and clockwise motion the minutes. In this condition the leds associated with the six press buttons all glow. The knob changes the tuned frequency, up or down by turning it clockwise or anticlockwise, when the tuning button is depressed after the receiver has been switched to fm or am radio.

The receiver is automatically switched on when any radio or other source button is depressed. By depressing the off button, the receiver is placed in standby mode with the clock continuing to show the time. This action also places the powered speakers in standby mode and they are brought back to the fully active mode when the receiver itself is switched on.

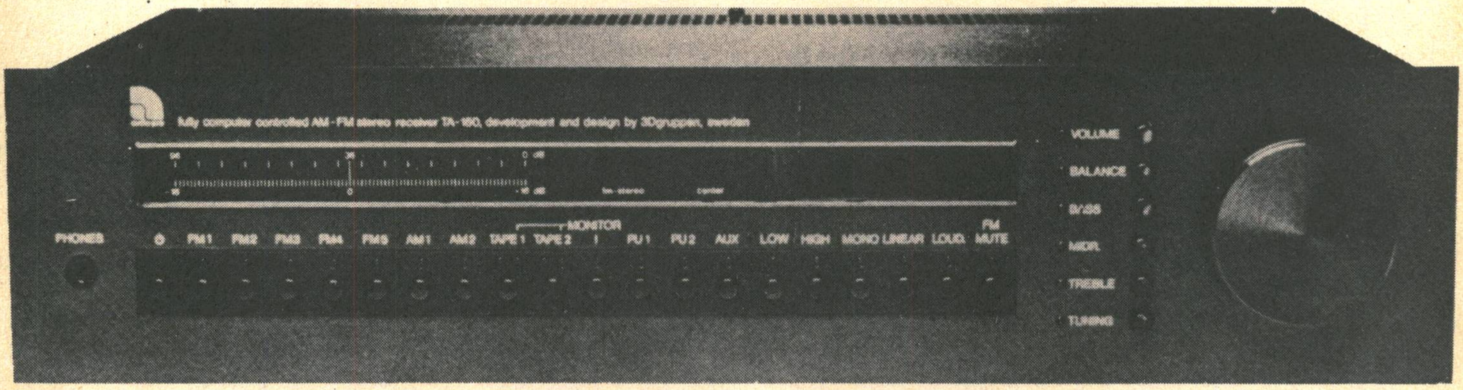
There are five fm and two am buttons and any one can be depressed to secure the appropriate radio function. If, say, button fm1 is depressed and a station tuned, the led aside the tuning selector button extinguishes after about five or six seconds and that station is then 'memorised' by the fm1 button, allowing for its subsequent recall. All the fm and am buttons can be likewise programmed for immediate recall of any of the stations previously selected.

When the receiver is switched on from standby mode the inbuilt microprocessor causes the receiver to 'monitor' sequentially all the functions in turn starting with volume, going to balance, bass, midrange, treble and tuning and then back to volume again. As each function is monitored so the sixteen leds along the scale reveal the previously established control knob setting for each one. The position for each one is held for about two seconds before the next one is monitored. As a point of safety for both 'ears' and speakers, regardless of the previous setting for volume this function always returns to a low-level setting whenever the receiver is turned on from standby, but this does not apply when changing between sources.

The microprocessor is the National Semiconductor SC/MP and the programming is in binary code (digital) form as instigated by the press buttons and control knob. The latter works optically such that two photo-transistors and an led sense 64 black and white segments at the back of the control, these producing electrical pulses as the control is turned. It was the plan of the designers to provide overall electronic tuning control devoid as far as possible of moving parts or electrical contacts and hence aim towards a high level of reliability (statistics tend to indicate that the reliability of any electronic equipment

–AMP/ TUNER

BY GORDON KING



diminishes with increase in number of electro-mechanical components, such as potentiometers, switches and the like). It must be admitted, though, that micro-switches would appear to be used for the press-button operations.

Muting circuits operate for a short period each time a function is changed to prevent 'clicks' and 'plops' from the speakers; but it was noticed that a small click occurred when changing between some fm programmes using the buttons.

Apart from radio, there are also switched inputs for two magnetic pickups (one can be moving-coil) and auxiliary source. There are also provisions for two tape machines with separate monitor selection. All these are operated by easy-to-press micro-switches in an extended row at the bottom of the fascia along with the radio buttons. Also included are buttons for low, high and loudness filtering with a 'clear' button for quick comparison with the linear (flat) condition, and fm inter-station muting. The buttons activated are revealed by small red-glowing leds above them.

The fm tuning point is shown by two adjacent leds which glow red at equal intensity when the tuning is correct. In the event of initial error, correction is performed automatically by afc when the function changes from tuning back to volume, as earlier explained. The displayed frequency is also corrected to the nearest 100kHz digit. A stereo transmission is indicated by the lighting of a 'green' led. The fascia also carries a headphone jack socket which disconnects the speakers (e.g. pre-amplifier output) when a headphone jack plug is inserted.

DIN sockets are used exclusively at the rear for the sources and for connecting to the powered speakers. Frankly, I must admit to preferring 'phono' type sockets, but no undue problems were experienced with the DIN circuitry.

I was very pleased to see that a 75-ohm coaxial socket is used for fm aerial connection, complemented by a 300-ohm balanced European type socket. Good aerial matching was achieved in the lab with the minimum of voltage standing wave ratio (vswr).

The Audiolab results expose a tuner of exceptionally high fm sensitivity and of fair/good 1mV stereo signal-to-noise ratio. Limiting comes on nice and early which will be useful when tuning weak signals, and the fm front-end is not unduly bothered by strong-signal spuriae, as shown by the acceptable RFIM dB ratio. Selectivity was fairly 'average', but not really narrow enough for serious DX-ing. On the other hand, residual pilot tone was well tamed but seemingly at the expense of upper-treble roll-off, as shown by the upper traces in *Fig 1*. The two channels were in very accurate balance. Stereo separation was excellent mid-band, though diminished at the treble end, which is not unusual.

Mono and stereo distortion were also fairly average and not particularly low for a tuner in this class. However, you can rest assured that the distortion on the radio programmes will always be in advance of that produced by the tuner itself!

When tuned in accordance with the facilities provided, my local Radio 2 station was indicating 88.0 MHz instead of the correct frequency of 88.1 MHz.

The control amplifier section was capable of 7V per channel to clipping threshold into a high impedance load and over four volts into 600ohms. There is adequate output, therefore, to drive any separate power amplifier and the powered Audio-Pro speakers. Below clipping point the distortion fell dramatically, but not right down to the low that has recently been measured from some Oriental amplifiers; nevertheless, low enough to be essentially of academic value only! No extra distortion was produced by the pickup pre-amplifier, which was also found to have an acceptably high overload margin. No problems at all with the signal-to-noise ratios or, indeed, with residual hum and noise which, unweighted, measured a mere 62μV.

Stereo separation, too, was beyond criticism, but I couldn't help wondering whether an upper-frequency response extending to more than 100kHz was not on the high side. Because the control amplifier will be connected to the powered speakers through screened cable the output impedance could become an important factor to upper-treble roll-off. Happily, there were no problems here because it would require quite a substantial shunt capacitance to pull down the treble response owing to the desirably low output impedance of the control amplifier.

The upper traces in *Fig 2* pen-chart show the deviation from RIAA (just a shade of lower spectrum lift) and the low and high filters with the RIAA deviation. Both filters are of fairly slow roll-off rate, which reduces their value, but of acceptable turnover frequencies. The same pen-chart shows the loudness contour at −30dB by the lower trace. This merely provides bass lift. No treble compensation.

Fig 3 pen-chart reveals the tone control characteristics at full lift and cut. The curves are alorithmic-synthesised which means, for example, that the midrange filtering is synthesised by subtraction of the bass and treble signals from the net input signal before the gain control section. The resulting curves are certainly unusual, but in practice the bass and treble results were subjectively palatable. However, excessive midrange lift or cut was akin to the signal passing through a notch filter. More about the auditioning of the overall system is given later.

The electronics are built around circuit board modules which are plugged into a mother board, a technique which not only facilitates subsequent servicing but which also aids pre-testing. Incidentally, the module for pu2 can be the same as that used for pu1 or a different one designed for a moving-coil pickup. Alternatively, it is possible to use a separate auxiliary module instead of a pickup module. The test sample was equipped with the normal pickup module for pu1 only.

No size advantage is gained by the TPA-150 being without a power amplifier section since its dimensions of 495 x 260 x 115mm (19½ x 10¼ x 4½-inches) are the same as those of the TA-150. It is that much less heavy, of course.

A4-14 speakers

NET weight of each of these is 16kg, and having in mind that the −3dB response point is right down at 30Hz it is apparent that something more involved that driver units alone must be contained within the relatively modest dimensions of 520 x 308 x 265mm (20½ x 11¾ x 10½-inches). In fact, each enclosure contains two amplifiers, one for the bass units and the other for the midrange and treble units.

For the bass end a reflex type of enclosure is employed but with an astonishingly small volume of a mere five cubic feet. The bass is extended by the use of a special drive arrangement and by the bass amplifier. Two five-inch bass drivers are effectively 'push-pull' disposed in the bass loading part of the enclosure. This method of loading, of which the polarity of the amplified signals applied to the units is correctly phased to avoid acoustic cancellation, neatly reduces even-order distortion, which is a bug of conventional non-powered systems of relatively small dimensions when driven hard.

It is not particularly difficult to achieve midrange and treble results from a small enclosure, but for true, deep and non-distorted bass a much larger enclosure is usually essential. With the smaller type of system the bass response is commonly enhanced by reducing the sensitivity at the middle and high frequencies. This provides a 'flat' sound pressure response down to lowish frequencies, but at the expense of an overall reduction in efficiency. This is one reason why properly designed small-size hi-fi speakers call for amplifiers of quite high power fully to drive them. Even so, the bass delivery is still limited by enclosure size and bass unit design, and if the bass drive is turned up in an endeavour to approach the lower octave the distortion swiftly rises. The push-pull configuration of the two bass units significantly reduces the distortion, thereby allowing a greater drive. As already noted, the technique is also used in the B2-50 subwoofer and the technicalities involved are described in a paper presented to the Audio Engineering Society on 5th November 1978, a copy of which can be obtained from *Audio-Pro (Hi-Fi) Limited, of Brook House, Crewe Road, Wheelock, Sandbach, Cheshire, CW11 OQU.*

The speakers are housed in black-finished cabinets fronted by a shaped acoustic foam grille, also black, which is easily removable to expose the one-inch soft-dome tweeter and 4½-inch paper cone midrange unit. An interesting feature is that the dome of the tweeter protrudes slightly from the front baffle line to avoid diffraction patterns and to aid with dispersion. The grille material was specially chosen to prevent interference with the upper-frequency response. The midrange unit takes over from the tweeter below about 2.5kHz, but some energy was heard from the tweeter down to about 2kHz. The midrange unit goes down to about 300Hz, at which frequency the bass drivers take over.

The bass drivers face downwards only a few inches from the floor, and because they are carefully positioned close to the rear of the speaker the direct sound tends to remain in phase with the sound reflected from the floor and the wall behind the speaker. The partnership with the bass amplifier means that the system as a whole can be tailored for the best control over the moving mass, compliance and damping of the bass drivers. The amplifier is also engineered to cancel the electrical impedance component of the speech coils. These aspects of the amplifier thus precluded meaningful lab measurements of the usual amplifier kind.

A separate amplifier is used for the middle and treble parts of the audio spectrum and a computer-optimised passive frequency-divider is used between the midrange unit and tweeter. Active filtering is adopted between the midrange and bass units. This sort of design thus facilitates separate 'energy' controls for both bass and treble, and at the bottom rear of each cabinet are two controls labelled bass and treble for 'room matching' adjustments. The bass control, in fact, is roughly calibrated in terms of 'angle' of radiation into a room corner, floor only, wall and floor, etc. Maximum bass delivery obtains with the control set to 4~, which would be used with the speaker sited at least 80cm from floor, ceiling or wall. When a speaker is located with respect to one surface (floor, ceiling or wall) the 2~ setting would be more appropriate. The bass output is further reduced with the control at the ~ setting which would probably be found desirable when a speaker is located at the intersection of two surfaces, such as at a floor/wall intersection. The least bass emenates in the ~/2 setting and this would be used when there is a lot of bass lift resulting from sheer room-corner siting of a speaker. It is, of course, possible to adjust each speaker independently of the other. The control is continuously variable so with experimentation it is possible to establish the most desirable setting for a wide range of different acoustic conditions.

At the treble end, different listening rooms have different coefficients of absorption. A heavily carpeted room with soft furnishings, for example, absorbs more treble than a room with a hard wooden floor and next to no drapes or soft chairs. I know some hi-fi devotees who drape their walls with heavy carpets to minimise the reverberation time! The treble control can be used to compensate for these differences. The effect is not the same as adjusting the

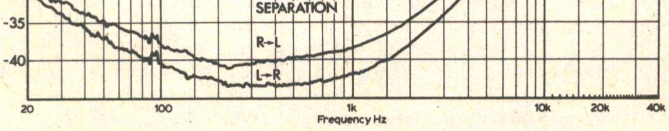


Fig 1 *FM stereo frequency response left and right channels and inter-channel stereo separation. Modulation level 20 per cent at 1kHz. 50µs pre-emphasis applied to modulation signal.*

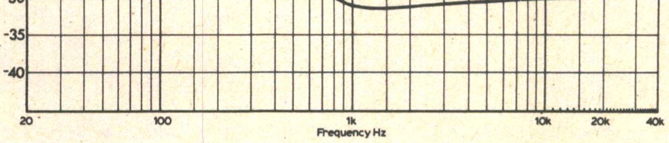


Fig 2 *Deviation from RIAA (PU1 input). Low and high filters (PU1 input). Loudness response at −30dB (PU1 input).*

treble at the receiver since it is the actual radiated energy which is adjusted by the speaker control without much change taking place at other parts of the frequency spectrum.

There is also a rear control for setting the sensitivity of each speaker over a wide range. Three press-buttons are also present on the control panel. One provides bass blend between the left and right channels, which can be useful for reducing the effects of record warps, rumble and acoustic feedback without seriously affecting directionality because such information on the signal is minimal at the bass end, anyway. Another makes it possible to apply the receiver (control amplifier) signal to either one of the two speakers. The third provides for automatic switch-on when the power amplifiers in stand-by mode detect the presence of signal applied. Each speaker needs to be mains powered and one is connected to the other by a DIN-plug-terminated cable. A similar cable then connects either speaker to the control amplifier output. With the speakers powered in the standby mode a green led shows at the bottom metal grille. When the speakers are energised by signal or manually switched on by the auto/on button a red led also shows. Power consumed in the standby mode is small, in the region of 2.5 watts only.

It would be possible to operate the speakers from the speaker outputs of any ordinary amplifier, but this is not particularly desirable since then the distortion of the amplifier itself is added to the signal. The distortion is generally lower from the pre-amplifier part of an integrated amplifier as it excludes the power amplifier section distortion, so this sort of connection should be adopted wherever possible. The Audio-Pro TPA-150 is thus ideal for operating the speakers.

The speakers were connected to the control amplifier output of the TPA-150 for all the listening tests, and all operated very well indeed, including the automatic switch-on function. Incidentally, the speakers return to standby mode a few minutes after the audio signal is removed, even by turning down the volume control.

Auditioning impressions

With the bass controls set to suit the listening room, we were greatly impressed by the clean quality and firmness of the lower octaves delivered by such relatively small speakers. There was complete freedom from the *'overhang'* and *'booming'* effects sometimes heard from speakers of minimal dimensions when driven hard with a touch of bass lift at the amplifier. There is no doubt in my mind that the designers have set a new standard from which bass reproduction can now be judged.

Upper treble was felt to be a trifle on the harsh side, and to tame this we were obliged to make a number of experimental adjustments to the treble controls on the speakers *and* amplifier; but the two lots of adjustments interacting with each other made optimum selection critical. A number of experimental adjustments were made in an endeavour to isolate a touch of stridence which occurred around the upper-middle register on some programme material. The best results here required a slight reduction in treble at the speakers and a 1dB midrange cut at the amplifier. We had the impression that the tweeter was letting through a little too much upper-middle (around 2kHz) signal. A slight increase in tweeter crossover frequency might help.

There was no problem in generating peak sound pressure levels of 96dBA without distressing the speakers or power amplifiers. Well recorded organ music came over with remarkable realism, the deep bass emanating throughout the room rather than *from* the speakers, and during these tests spl peaks up to 100dBA were measured.

The receiver was not difficult to use once one became accustomed to the lone control knob and the press button selection for control mode! The press button station selection was well liked. The am mw section was of average sensitivity but the best results from the rear ferrite-rod aerial could not always be obtained since the rod cannot be swivelled. It was also necessary to tune over the mw band fairly slowly to avoid outpacing the tuning time-constant.

Indeed, certainly a very interesting system and one worth listening to. The TPA 150 costs £555.45 and the A4-14 speaker pair £747.50, both *inclusive* of 15 per cent VAT. These are the last count recommended retail prices, so you will need over a grand in your pocket to do a deal!

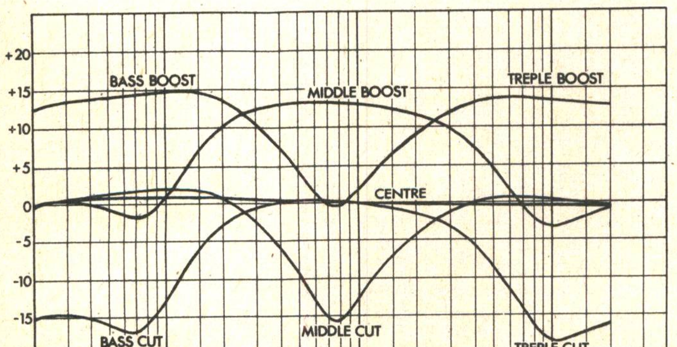


Fig 3 *Bass, middle and trable tone control responses at full boost and full cut. Input auxiliary.*

TPA–150 TEST RESULTS

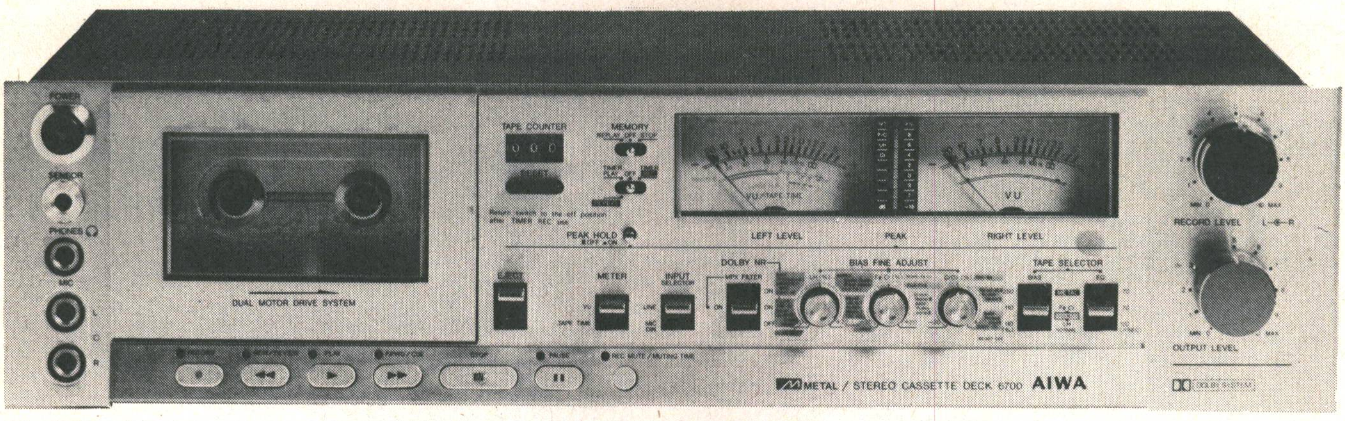
FM SECTION	
Inputs for	
30dB S/N mono:	0.8μV
50dB S/N mono:	3μV
50dB S/N stereo:	32μV
−1dB limiting:	1.1μV
1mV S/N ratio:	68dB mono: 66dB stereo
RFIM:	≈74dB av.
Capture ratio:	≈1.3dB
Selectivity:	60dB alternate channel
AM rejection ratio:	56dB
Pilot tone rejection ratio:	66dB
Distortion 1kHz:	0.25% mono; 0.4% stereo
Stereo frequency response/separation:	Fig. 1
AUDIO SECTION	
Maximum output:	7V high Z; 4.4V 600 ohms
Distortion 1V output 1kHz	
high level:	0.01% high Z; 0.04% 600 ohms
pickup:	exactly as above
Sensitivity for 1V output 1kHz	
high level:	240mV high Z; 300mV 600 ohms
pickup:	3.6mV high Z; 4.5mV 600 ohms
Pickup overload voltage:	180mV 1kHz
S/N ratio ref 1V output	
high level:	81dB ref 0.5V input
pickup:	76.5dB ref 5mV input
Residual hum and noise:	62μV
Stereo separation pickup:	64dB 1kHz; 64dB 10kHz
Frequency response −3dB auxiliary:	15Hz->100kHz
Output impedance:	≈300 ohms at 1kHz
Deviation from RIAA:	Fig 2
Filters:	Fig 2
Tone controls:	Fig 3
Prices:	TPA-150 (£555.45) A4-14 (£747.50) inc VAT

Manufacturer: Audio-Pro Hi-Fi Ltd, Sandy Lane, Moston Road, Sandbach, Cheshire. (093-67 7520).

Notes: Reference modulation level 100% (FM stereo). Noise weighting CCIR/2kHz 0dB (e.g., CCIR/ARM). Distortion on test signals less than 0.003%. Input loading according to IHF latest.

Laboratory facilities: Gordon J. King (Enterprises) Limited, Brixham, Devon.

AUDIOLAB REPORT



AIWA AD6700 CASSETTE DECK

THE latest innovation in cassette recording, as many people will now know, is 'metal' tape. If this word is new to your ears and conjures up images of a product so strong that its use may seem more fitting in a battlefield, I will quickly point out that 'metal' in this instance refers to the magnetic coating of iron powder, not the base film which remains flexible plastic. The fact that metal tape needs 'metal' decks doesn't mean that the latter are specially reinforced, but that they have certain revised and improved features that allow them to record and erase this new tape type. With the advent of metal tape, which is very expensive by the way, we are now experiencing the first wave of 'metal' compatible cassette decks from Japan and this report looks at one of them — the Aiwa AD6700.

Unlike the Elcaset, metal tape comes in the standard cassette package, even though one manufacturer, TDK, has chosen to put metal tape in a metal cassette housing of cast zinc. Its main benefit is ability to accept higher treble recording levels before distortion sets in, so providing cleaner sound quality. Unfortunately, this new tape needs very high levels of bias and erase current through its heads and this has brought about the need for improvement in head design. So the main difference between an ordinary cassette deck and one compatible with metal tape lies in the heads used and of course the provision of suitably high bias current for recording. These additional features increase the front panel knob count of course and since metal tape is a quality item, suitable decks are commensurately expensive and complex. The AD6700 is no exception and Aiwa have taken time out to load it with devices and gadgets.

Apart from its ability to handle metal tape, one obvious distinguishing feature of this deck is its infra-red remote control system. This sort of thing is becoming fairly commonplace on televisions nowadays, but it has to be commonly adopted with hi-fi equipment. I never quite know whether this sort of thing really is useful or can be crudely categorised as a bird-pulling gadget. I found the small hand-held transmitter had the same attraction for humans that a light bulb has for moths. Leave it on the lounge table and there will always be plenty of fiddlers pressing the buttons while the deck uncannily whirrs away obediently in a corner of the room. I never got to use the transmitter, not through a cussed dislike for gadgets, but simply because I don't play tapes for hours or sift through the selection on a side. While on the subject of this remote control system though, I did find it worked impeccably, even at a distance and a wide angle off-axis from the sensing eye on the deck's fascia.

All transport functions are provided, such as *play, record, rewind, pause,* etc, but you cannot set record or replay levels. A little red arrow flickers when a command is made and all-in-all this thing doubles pretty well as an adult's Star Wars gun. I can leave it to you to decide whether remote control will be useful

Another useful (?) gadget that I have not seen before is a 'tape remaining' indicator. One of the record level meters can be switched to show the amount of tape playing time left. Aiwa say that it detects the speed of the left-hand emptying tape hub (deucedly clever). Their observations brought a wry smile to my face in stating that you don't, with this system, have to keep looking at the cassette window to check how much tape is left. This is true of course — you look at the meter instead! Same difference, as they say. Cynicism apart though, there is the advantage that the amount of tape left is given in terms of approximate playing/recording time which should give any user a good idea of whether a programme being recorded will fit onto one tape side for example.

I was happy that the cassette tray has a large clear window and back-illumination is provided for the cassette window so you can see at a glance precisely what is happening at any given instant. As usual, the transport controls sit beneath the cassette compartment on an angled shelf but on this deck they are touch-buttons (mechanical) with a very light action. In addition to the usual functions there is a muting button here so a record signal can be cut out if desired (this is otherwise known as a DJ killer). An led indicator flashes at one second intervals to tell you the length of any silent passage made in this way.

Aiwa have fitted their extremely convenient cue/review system to the AD6700, a novelty that I admit to finding useful. It allows the machine to wind forward or backward immediately from either record or playback modes, with a speeded up Mickey Mouse version of the recording being provided to allow position identification. Faster reeling without this output can be obtained by first stopping the transport in the normal fashion, and then selecting either fast forward or reverse. This system, together with the light action controls that are goon-proof due to electrical interlocking allowing the AD6700 to perform very smoothly and with complete freedom from error. You should never break a tape or wrap it around the cassette no matter what you do with this deck.

One other feature associated with the transport system is 'punch-in' recording where the deck can be put from play mode straight into record without stopping the transport first. This allows consecutive recordings to be accurately dovetailed together. A small point I also appreciated is the fact that record levels can be set after pressing the record button alone. You don't have to go through the tedious rigmarole of putting the transport into pause first, and then simultaneously selecting record and play functions. After setting record level, the transport starts immediately when the play button is depressed, while keeping a finger on the record button. I have had quite a few Aiwa decks with this transport system now and I find it one of the easiest and slickest to use.

In line with another popular trend the AD6700 has variable

BY PHILIP MOUNT

bias, with levels for ferric, chrome and ferrichrome tapes independently adjustable. Perhaps surprisingly though, bias for metal tape is not variable and Aiwa recommend but one make — Scotch Metafine. Doubtless, this is due to the fact that Metafine was the first metal tape available, to manufacturers at least. At the time of writing, early January 1980, it was still not widely available in the shops, however. In a nutshell though the AD6700 is set up for one metal tape and that's it. If you don't like it, you can lump it! Obviously, it is only a matter of time before TDK, Sony, Philips *et al* bring their own metal tapes onto the market and then how useful will the AD6700 be? Unfortunately it is not a question I can answer with any completeness.

I have one sample of TDK MA-R metal tape which is definitely not interchangeable with Metafine, since it possesses far greater treble sensitivity at Metafine bias levels as the response graph shows. How other tapes will compare is anyone's guess until samples become available. I will point out that JVC have equipped their metal-compatible KD-A5 deck with switched adjustable bias for metal tape to cope both with this situation and the likelihood of sample variation, too. The fact that the AD6700 is set up for one metal tape brand only must limit its attractiveness and carries the danger placing overall performance at the mercy of one tape formulation. I don't find Metafine an exceptional tape in fact, and believe that Aiwa have placed themselves in a perilous position here, more of which later.

Variable bias allows the AD6700 to be accurately adjusted for a flat response from almost any tape type and brand, so you can use more-or-less any conventional tape you choose with the deck. Aiwa recommend a wide selection in their handbook and a sticker on the deck's front panel indicates suitable bias settings for popular brands.

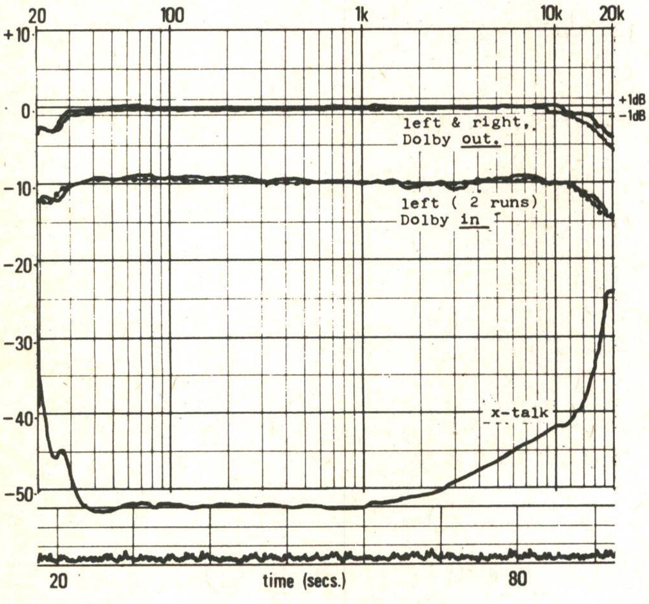
Other features to be found on this deck (yes, we haven't exhausted them yet) are a peak-hold facility linked to the record-level meters to show maximum level reached during a programme and a sequential led level display to show peak levels as they occur. The latter is a very pretty display placed between the record-level meters that lights up green, yellow and red, in that order, as recording level increases.

Aiwa usefully mark recommended peak levels for various tape types against the display, although this sort of thing is always somewhat arbitrary and open to argument. A 'memory' allows the deck to rewind to 000 on the tape counter and either stop or automatically go into replay mode, while operation from a timer is provided for too. There is even a repeat playback system where the deck will continuously play from 000 on the counter to the end of the tape. I should also mention that Dolby noise reduction is of course fitted with the option of switching in a 19kHz mpx filter when making recordings for vhf/fm stereo transmissions. This is to avoid beat whistles between the 19kHz pilot tone and the deck's bias signal.

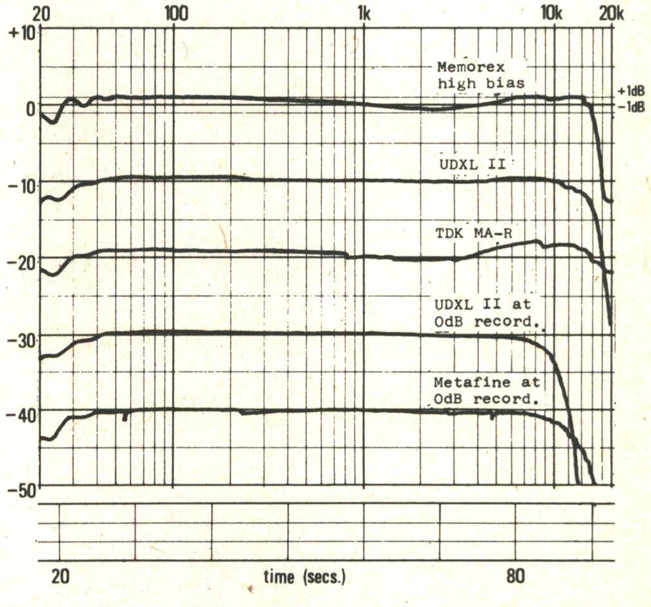
Since one of the most significant features of the AD6700 is its metal tape, or to be more succinct, Metafine compatibility, performance with this tape was looked at closely. Frequency response can be seen in *graph 1* with Dolby in and out (mpx filter inoperative). Although this is reasonably flat treble output was a bit limited and you can also see an amount of bumpiness on the traces. This was caused by variable output from the tape itself, not by the machine, and is one reason for my reservations about Metafine performance. While output from TDK MA-R was steadier it predictably displayed boosted treble, making it sound far too bright on this deck (see third trace down, *graph 2*).

Both Memorex High Bias and Maxell UDXLII are good tapes that worked fairly well with the AD6700, although sudden treble loss is evident above 16kHz. Another AD6700 I tested some months before this report didn't suffer this effect, but I couldn't get the review sample for this report to manage as well in spite of some careful head cleaning. However, the results broadly tally with Aiwa's quoted specification for the deck. The bottom two traces in *graph 2* show how output at high frequencies falls due to magnetic saturation (equivalent to overload) at high recording levels, in this case 0dB (OVU). Maxell UDXLII, a very good pseudo-chrome, is −3dB down at 10kHz while Metafine reaches 13kHz under such circumstances. While this graphically illustrates a difference between the two tape types, it doesn't provide any indication of how distortion is reduced by the superior properties of metal tape (note that while I say 'superior' I am not tacitly trying to imply that metal tape is vastly superior).

While the Aiwa deck provides better treble output with Metafine than with the pseudo-chromes shown in *graph 2* (and TDK SA which I tested but is not shown), by current standards response was not very extended with any of these tapes. Maxell UDXLII, when set up to give the response shown, which by the way required less bias than that indicated by Aiwa, sounded fairly dull as I would



Graph 1 — *Frequency response and crosstalk with Scotch Metafine tape, Dolby out along 0dB line, Dolby in along -10dB line.*



Graph 2 — *Frequency response with various tapes, top to bottom — Memorex High Bias, Maxell UDXL-II, TDK MA-R, Maxell UDXL-II and Metafine — the last two being at peak record level of 0dB. The first three at -20dB as usual.*

expect from the falling treble characteristic. Results should have been better considering the apparent quality of the deck. As *graph 2* shows, separation between channels was very good.

The deck was accurately adjusted for Dolby level and as usual Aiwa have placed peak record level at −3dB below the Dolby level of magnetisation, as all Japanese manufacturers do. Replay response was accurate which allows the deck to provide correct tonal balance from commercially pre-recorded tapes.

A comparison of distortion levels for Maxell UDXLII and Metafine was interesting. As you would expect Metafine showed up one third the distortion of UDXLII in the upper mid-band and I would expect this gap to widen at high frequencies, so there's no doubt that metal tape will provide cleaner treble output. However, the promise is that it will also allow higher overall recording levels to be used, which means more mid-band and low-frequency headroom too. This wasn't realised on the AD6700 where UDXLII, which performs unusually well in the mid-band I should add, returned half as much distortion as Metafine, thus turning the tables somewhat. So a good pseudo-chrome such as UDXLII has more headroom in the mid-band than metal tape (or Metafine at least). Thus there is no clear-cut winner and nothing to suggest that Metafine will accept a higher overall recording level than UDXLII for example.

Both tapes suffered very bad distortion at low frequencies, almost certainly as a result of tape head saturation. With a measured level of six per cent distortion at peak record level (OVU) it is obvious that the AD6700 has a problem here and rock music, which often has a strong continuous bass line, will cause early overload of the head unless recording levels are kept down. Obviously, with record levels limited by low frequency performance of the head, there is no scope for realising any benefits that metal tape, or any tape if it comes to that, may offer. So much for metal tape compatibility!

Noise levels will be a function of the tape used, not the deck itself and with Metafine a noise figure of −59.5dB was recorded with the Dolby system operative.

Input sensitivities were normal and the mic and DIN input share a sensitive pre-amplifier. When working with either of these the level control should not have to be retarded below '1' on the scale of 10 or the input will be going into overload before the meters read OVU. This is a common situation on cassette decks, but it doesn't apply to the line input I should add, since this feeds the level control direct, not an active stage. Overload occurred at 90mV on the mic input so there is quite a lot of headroom for high output microphones here.

The headphone socket provided a high quality output with level adjustable from the front panel output control. Output impedance was relatively high at 121 ohms, causing maximum level to fall from 2V to 0.124V with eight ohm headphones connected. This should be enough to drive most headphones though.

In spite of the many obvious features of this deck such as metal tape compatibility, Aiwa choose to pick out its speed stability as a number one feature on page 2 of their handbook for this product. The deck has separate capstan (this item pulls the tape past the head at an even speed) and reel take-up motors (these drive the two reels to avoid tape slack, tension etc). The capstan motor has a servo feedback speed control system and they say 'thanks to the incorporation of these latest techniques, a superb wow and flutter of 0.04 per cent is guaranteed'. This latter figure is 'wrms' (weighted rms) which provides a lower figure than the DIN technique commonly used in Europe and used by myself for these. In fact, many good decks have the same transport as that used by Aiwa on the AD6700.

I was impressed by a relatively low level of wow from this unit though and overall wow and flutter, DIN weighted, measured 0.05 per cent. The wow and flutter level over a period of 100 seconds can be seen along the bottom of *graph 1*. The point to note here is that level remained steady over this period. Some decks suffer a variable performance.

I think that having read up to this point in the review it will be plain to you that I don't have much regard for metal tape at present for reasons that are quite obvious. Doubtless, metal tape will establish a more definite quality lead over good chromes/pseudo-chromes in the future but at present it confers little benefit in a practical situation.

In use I didn't get better sound quality from this deck with Metafine and the comparative measurements of distortion against Maxell UDXLII shows why. Generally, considering the deck rather than metal tape, the AD6700 worked beautifully and was a pleasure to use but sound was in most instances, after bias adjustment, dull and veiled, losing crispness and definition between instruments. It is most likely that loss of extreme treble, coupled with low frequency distortion was responsible for this result. I was happiest using BASF Chromdioxid Super on the AD6700 which although more expensive than pseudo-chromes is much cheaper than metal tape while being comparable or better in many areas of performance. It provided very smooth, coherent results on the Aiwa and was superior I feel to Metafine or most other tapes in this case. While the AD6700 is a nice deck to use and provides quite good results with BASF Chrome Super, I still feel it should have managed just that bit better for the price £315 inc. VAT.

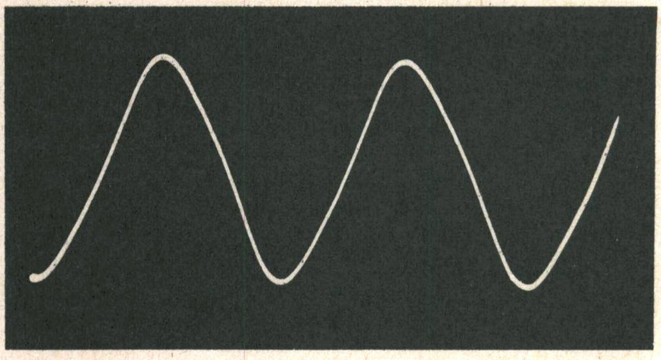
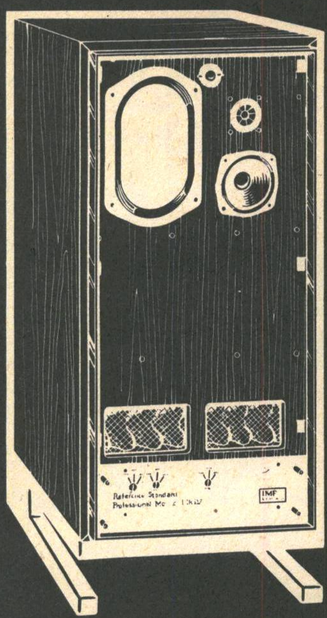


Fig 1 — *Low frequency distortion caused severe triangulation of a sine wave test signal, seen here. This was due to six per cent third harmonic distortion, a very high level and due to head saturation.*

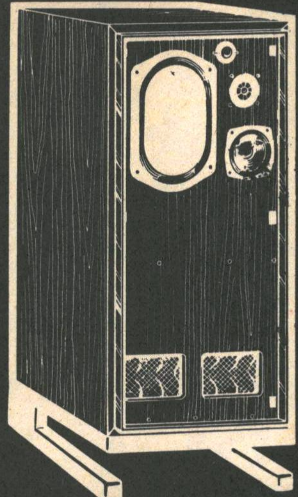
AD6700 TEST RESULTS

Tape used for tests:	Scotch Metafine unless otherwise stated
Peak recording level:	Indicated: −3dB Measured: −3dB (OVU level accurately adjusted)
Frequency response (record/replay):	25Hz to 20kHz ±3dB Dolby out 25Hz to 18kHz ±3dB Dolby in
Separation:	−52dB at 1kHz
Distortion at OVU (record level meter at −2dB ref. OVU Dolby in:	At 333Hz: Metafine 0.74%, UDXLII 0.4% At 40Hz: Metafine 6.5%, UDXLII 6.1% At 4kHz: Metafine 0.3%, UDXLII 0.9%
Comments on distortion:	Head saturation at low frequencies is very poor
Sensitivities:	Line, 40mV, DIN 0.2mV
Overload:	Line >7V DIN 90mV (+53dB)
Headphone output:	Frequency response ±3dB 26Hz to 26.5kHz into 8 ohms Output level: 124mV into 8 ohms 2V into open circuit Output impedance 121 ohms
Speed variations: (to DIN 45507)	Drift: +0.1% to −0.1% peak-to-peak Wow: 0.08% quasi-peak unweighted Flutter: 0.12% quasi-peak unweighted
Total wow and flutter:	0.05% quasi-peak DIN weighted
Price:	£315 inc. VAT

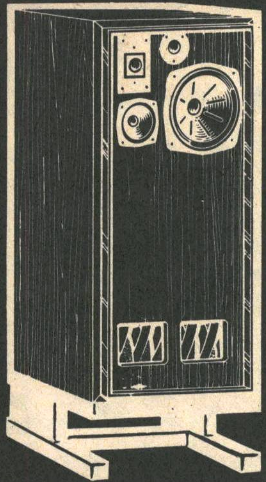
Aiwa Sales and Service Ltd., Aiwa House, 30-32 Concord Road, Westwood Park Trading Estate, Western Avenue, London W30 TH



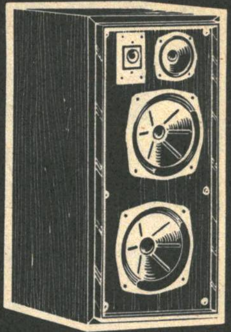
Reference Standard
Professional Monitor
Transmission Line
4 Way



Monitor TLS 80
Transmission Line
4 Way



Studio TLS 50
Transmission Line
4 Way



Studio ALS 40
Active Line
4 Way

IMF Electronics LOUDSPEAKERS

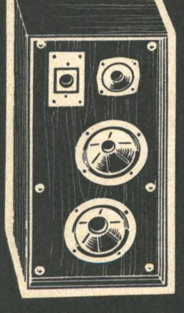
are renowned worldwide as a result of pioneering research into transmission line and active line principles.

A complete range of the finest quality systems are hand built to laboratory standards. Superbly finished in walnut, the rigidly braced cabinets are veneered internally for stability. They are produced in "mirror image" configuration with phase coherent crossover and driver layout.

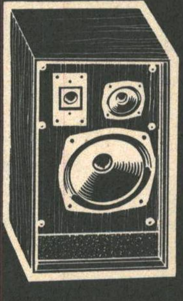
Frequency response from the lower bass regions to beyond audibility ensures that every nuance of the programme; be it classical or popular rock, is reproduced with supreme accuracy. Performance, not price, is the criterion.

Although having many famous studio, laboratory and professional users, they are equally accepted in the domestic environment. Coupled with the best ancillary equipment, they will fulfil any requirement to reproduce even the most demanding material.

Listen to them at your nearest IMF Electronics dealer. Buy them and be confident that continuing listening pleasure is assured.



ALS 30
Active Line
4 Way

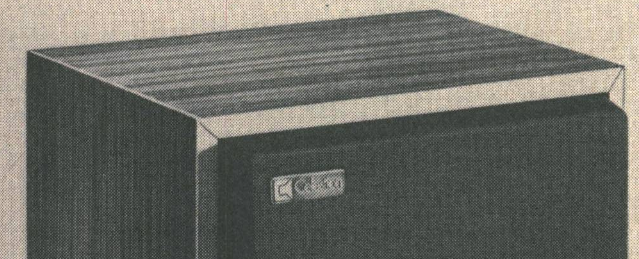


Super Compact
Reflex
3 Way

® IMF
ELECTRONICS

Westbourne Street High Wycombe Buckinghamshire Tel High Wycombe 35576
N America 5226 State Street Saginaw Michigan 48603 Tel (517) 790 2121

The new Celestion Ditton 120...when it comes to choosing a loudspeaker that is reasonably priced, technically superb and compact in size, now there is only one choice.



Dimensions: Height 395 mm. Width 265 mm.
Depth 230 mm.
Power handling: Maximum rated power 40 watts.
Amplifier requirements: 10-40 watts.
Teak, walnut or black finish.
For full details see your Celestion dealer
or contact: Rola Celestion Ltd.,
Ditton Works, Foxhall Road,
Ipswich, Suffolk IP3 8JP.
Telephone: Ipswich (0473) 73131.
Cables: Voicecoil Ipswich. Telex: 98365.

celestion
international

WHAT HAPPENS IN A RECORDING STUDIO?

by CARL ANTHONY

In this article, we delve behind the scenes to see just what effects are available to the record producer and engineer, and what uses they're put to.

I GET rather annoyed when people say you can't use modern rock music for system evaluation or comparisons. Surely the whole essence of a good system is that it can faithfully reproduce as much information as possible? With a modern multi-track recording you may argue that the final sound hasn't been as accurately captured as with, say, a crossed-pair recording, but that doesn't mean to say there's no information. Quite the reverse, in fact.

It's all too easy for those ignorant of modern studio techniques to argue the distortion is higher — no doubt it is — and therefore run the medium down. But when did you last really listen to what was going on? When did you last really *hear* what was going on?

With today's production techniques only a really good hi-fi system will allow you to extract the 'nuts and bolts' of the techniques employed. On a poor system, for example, a piano can sound — well, just like any old piano. A little bit fuller, perhaps, but not especially unusual. A better system might sound even worse! The piano could sound phasey or unclear. A very good system, on the other hand, could provide the explanation — not one, but *two* pianos. One recorded normally, and one overdubbed and slightly phased. Suddenly it's no longer a poor piano recording — it's two recordings combined to create a meaningful effect. To judge it simply as a piano recording is ludicrous — it was never intended to be. And the same is true of lots of sounds created in the studio. The essential core of the argument is not so much whether it's a natural sound, accurately recorded, but whether or not you can tell if it was ever meant to be in the first place.

Naturally, one has to exercise a considerable amount of judgement and experience. It's all too easy to assume a good bass guitar sound, for example, is an 'accurate' sound. It's not always 'the accurate' that is the most impressive. The real sound of the bass guitar may have been thin and boomy. There may have been a considerable amount of finger noise across the strings and the amplifier could well have been buzzing and hissing like mad. On the disc, however, the sound could well be ten-times more dramatic. Full-bodied and rich, with no extraneous amplifier noises and a little bit of limiting to keep the sound forward and punchy. Such is the crazy world of hi-fi, that most people would regard the former, 'accurate' sound as an example of a very poor recording technique and the latter, 'souped-up' version as realistic!

Effects — glorious and otherwise

Let's move now to what sort of black boxes are available to the producer and engineer during the recording and re-mix sessions. They fall into three main categories — reverberation; technical aids; and creative aids. First the technical aids.

Studios are faced with exactly the same problem as the domestic tape user — noise and distortion. Recording at low levels will introduce hiss and noise; recording at too high a level will result in distortion. With multi-track techniques the problems are compounded by virtue of the fact that there are not just two tracks on the tape but sixteen, twenty-four, thirty-two and so on. This, of course, means — and we'll use a twenty-four track system as an example — twenty-four sets of record amplifiers, replay amplifiers, twenty-four microphone channels all with amplifiers, twenty-four line channels, again all with several amplifier sections.

To keep things under control the majority of studios use the Dolby A noise-reduction system. There is a separate Dolby unit (or card) for each channel. In most cases the units operate automatically. Connected between the mixer and the multi-track recorder they encode all signals coming from the mixer's output (another reason why a separate monitor circuitry is used for listening — encoded Dolby sounds awful) and automatically decode any signal coming back from the tape machine. It's also quite normal to find a pair of Dolby units

SECRETS OF THE RECORDING STUDIOS **Part 1**

WHAT HAPPENS IN A RECORDING STUDIO? continued

connected to the quarter-inch mastering machine. These work in exactly the same way. Dolby, along with the dbx and Burwen systems, are all designed to keep as much noise out of the system as possible.

Two other devices are also frequently used at the other end of the scale — the compressor and the limiter. Their job is to handle high-level signals in order to prevent the tape overloading and distortion occurring. Many people confuse the two, but they have two quite distinct functions. In order to explain it, simply imagine a signal going into a box and coming out the other side exactly the same. This is called 'unity gain'. If we put a VU meter on the input and one on the output, both will give identical readings.

Now let's put in a compressor. On the front of the device will be two main controls — the *slope* and the *threshold*. Simply, the threshold is the point at which the compressor will start to work, and the slope is the degree of attenuation the device will provide. So if the threshold is set at −10dB any signal below this level will pass through exactly the same. Levels above −10dB will be attenuated. If the slope (compression ratio) is 2:1, then a +5dB input will come out of the device at −2.5dB and a +15dB input signal will come out at only +2.5dB and so on. Adding more compression, say 4:1, would result in the following degrees of attenuation — +5dB input would be reduced to −6.25dB and +15dB would be reduced to −3.75dB.

A limiter is a kind of ultimate compressor in a way. There is no slope as such, just a threshold. So if you fix the threshold at −10dB, any input level above −10dB would not be attenuated gradually but held fast at −10dB. So readings of 0VU, +5dB, or +15dB on the input meter would all give a −10dB reading at the output with a limiter.

Strangely enough, it's the limiter that is used to increase the apparent loudness of an instrument. How? Well, by holding down all the peaks to a given point its possible to raise the overall level of the quieter passages without fear of any sudden peaks causing distortion. Naturally, the system is open to abuse. It destroys the natural dynamic range but as the dynamic range of tape is limited, it can help to dovetail the two together if used with discretion.

The opposite of a compressor is an *expander.* Again this device bridges the gap between technical and creative possibilities. On the technical side the expander can be used to remove unwanted noise. In this application its known as a 'noise gate'. What it does is attenuate low level sounds. High level sounds go through the device, low level sounds (below the threshold) are quickly attenuated. So if we take an example of, say, a bass drum track which also contains some low-level noise, in this case the sound of the cymbals in the background, it's quite possible to set the threshold just below the main level of the bass drum, and at the same time above the level of the background noise with the result that the bass drum is heard and not the cymbals in the background. A creative use would be to deliberately cut into the natural decaying sound of a musical instrument thereby 'tightening-up' the sound and creating a much cleaner, more precise feel. This sort of technique is used quite often with percussive instruments.

Reverberation and ambience

In modern rock recording, reverberation and ambience are used primarily to enhance the sound of an instrument or voice rather than to specifically create an overall soundfield. To this end there are a number of devices available. The most popular is the echo-plate but you will also find spring reverberation devices as well as some solid-state ones.

The whole range is exploited. All the way, in fact, from a light touch of reverb on the cymbals to add depth and brilliance, to a full blown multi-repeat echo. In fact, the modern studio is not adverse to trying anything and a typical mix could contain nine or ten channels with varying degrees of echo plate reverbs; vocal tracks with single delays to create an overdub effect; harmony vocals with multi-delays (to create a chorus effect); snare drum with natural ambience captured in a lift shaft, or corridor, percussion recorded in the 'gents'; guitars out on the roof or in a field; tracks with tape loops both fast and slow.

The mind boggles and the possibilities are endless. Some are very subtle: others virtually stretch right across into the totally creative spectrum. In this area, reverb effects can be piled on top of each other to create new and interesting sounds. In some cases, it may have taken the engineer and producer two or three hours to just hit the right effect for what appears in the final mix for perhaps just a couple of seconds.

And even more effects . . .

The range of available effects has exploded over the past few years and certainly there's plenty of competition between top studios to offer the latest goodies or new ways of using existing ones to their clients. In a world populated by such weird and wonderful devices as the *'Time Cube'; 'Syntovox': 'Vocal-Stresser'; 'Time-Shape Module'; 'Time Modulator'; 'Gain Brain'; 'Band Selective Processor'; 'Harmonizers';* and *'Dynamic Reversers'* to name just a few, our poor old 'original sound' hardly seems to stand a chance. Fortunately this isn't always the case. Effects are sometimes only used for maybe a few bars, or over a chorus or an introduction and very rarely over the whole sound.

Quite often, you will find natural instrument sounds, artificial sounds and 'doctored' sounds all playing along at the same time. Getting the right effect at the right time is up to the producer generally. It's one reason why the re-mix session can take so long. The multi-track tape, as we said earlier, contains the raw material for the final sound. The special effects add emphasis, colour, texture and variety. So what are the sort of things a producer can do to the sound?

Well, for a start he can delay it and in this area the effects he can create are enormous. Take one such device — the *Marshall Time Modulator.* This is perhaps one of the most versatile units on the market. Among the effects it can create are double tracking of voices, triple tracking of guitars, three different forms of vibrato, guitar *arpeggio* effects, pitch quantizing, musically tuned echo and the familiar 'Leslie speaker' effect.

You can do intriguing things such as set one stereo channel to gradually go flat, and the other to go sharp, or both to go flat or sharp or crossover or whatever (so much for pitch control on the turntable!). It can be used as an automatic pitch following delay. In other words, the delay will alter according to the pitch.

And while we are on the subject of pitch, there's another well known device — the *Eventide Clockworks Harmonizer.* This allows any signal on the multitrack tape to be altered in pitch over a two octave range — without affecting the tempo. The beauty, of course, of this is that all you need do is record one guitar track, say, for example then later in the re-mix stage, if you want to use a harmony part all you need do is plug the track into the *Harmonizer* and back it will come in time, and in harmony! Makes you think doesn't it? Could you tell a real voice from an electronic harmony part on your system?

The effects, it seems go on and on, wow-wow; Dalek voicing; cardboard tube; hollowing; positive and negative flanging; phasing; positive and negative spin; limited spin. Take spin, for example. On the *Scamp 524 Time Shape Modulator,* it's possible to put in a single sound and the unit will provide a one-hundred per cent audio feedback. That one sound can be made to last indefinitely and modified s much as you like. An opening note on the first song on a record could still be there with the album finished!

Phasing and flanging, which is which?

Everyone seems to get these two mixed up — including the manufacturers. It's easy to see why if we look chronologically at how the two developed. The idea of phasing came originally from using two tape machines. Both were fed the same signal. One machine was deliberately slowed down usually by holding a finger or something against the spool. This created an interesting effect when the outputs from both machines were combined. Because there were small time differences between the two signals, phase shift cancellations occurred. These would vary according to the different delays created by the uneven pressure. As a result, the frequencies where cancellation and reinforcement were occurring would move up and down the audio range. In Britain, this effect is called phasing. Unfortunately, the top and bottom sides of a tape spool are also known as flanges. The Americans decided (naturally, I suppose) to re-name the effect flanging as the flanges of the spool were essential in creating the effect, (nowadays incidentally the time delays are normally created by a variable electronic pitch control).

Then came the great day of confusion. Somebody designed an electronic equivalent. Unfortunately, it didn't sound quite the same so the British called it a Flanger and the Americans called it a Phaser. Originally the design was meant for musicians who wanted to create the studio effect whilst playing live. Imports and exports between the UK and US resulted in total confusion! What the Flanger did (British version) was to try and re-create the effect by using a number of fixed phase-shift networks. The more they used, the greater the number of cancellations. Unfortunately, whereas the tape phasing created harmonically related cancellations, the electronic devices didn't. Newer devices incorporating a variable delay line more reasonably re-create the 'deeper'-sounding original tape effect because they introduce not only the phase shifts originally produced, but the time element as well.

Now you hear it, now you don't

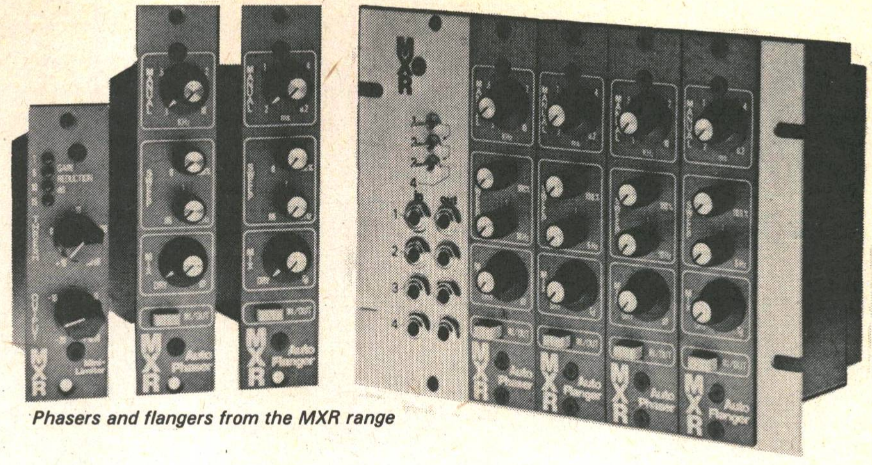
It must seem that the studio world is gadget-crazy and in some ways you'd be right. In the end, it's all up to the producer. If he wants a production 'gone mad', he'll have no trouble in finding a studio to cater for his every whim. In the main, though, most studios and producers work sensibly and only use a particular device if it improves the basic sound. A lot of their work is extremely subtle, and I should imagine goes quite unnoticed by the majority of listeners. In one sense, this is understandable. Unless you know what a guitar sounds like, it's unlikely that you will recognise an overdubbed one. But you should be able to detect production techniques, say, for example, on voices. Play a few records and just see how many you can spot. No doubt, you can easily recognise the lead voice and the harmonies, but listen again critically. Does the lead voice change — double-tracked for example? Or perhaps one of the harmony voices is phased, perhaps one isn't and the rest are. Are they all going at the same speed? Sometimes a producer will combine two tracks one of which has been recorded at the correct speed and one slightly slower.

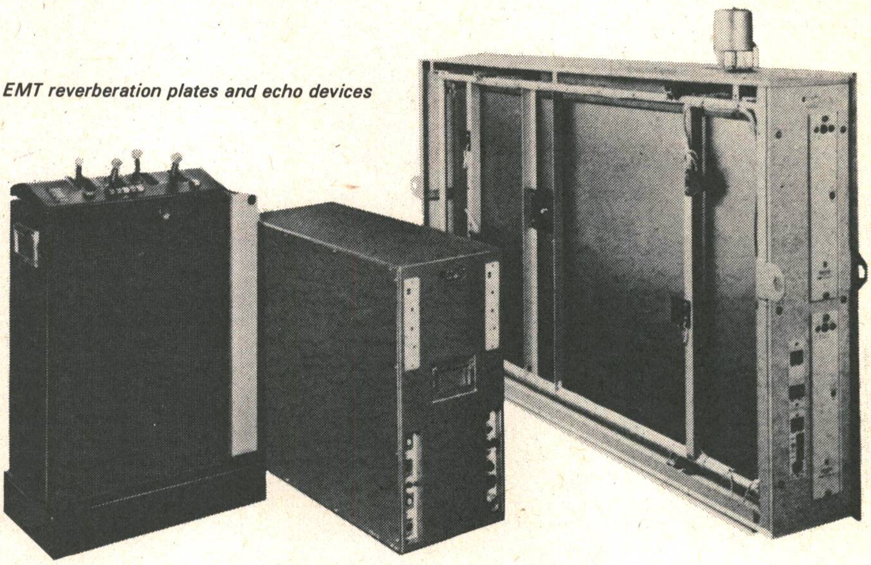
How's your pitch? You would be amazed at the number of times a tape machine is deliberately used at a faster or slower than normal speed Vocalists who can't reach the high notes, bass guitars that don't go down low enough without vibrating the drive units out of the cabinets. Drummers who can't keep up the pace, cymbals that require an extra zing. Soloists who play too slow or put in too many notes for the space they are meant to fill. Or in many cases it's the quest for an effect that couldn't be found naturally.

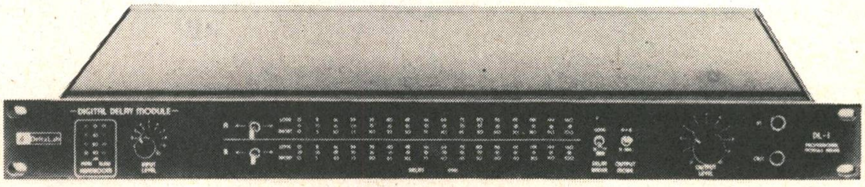
It's a difficult compromise. Many times the real thing is just not acceptable. Sure, with the spotlights and the dry ice the real thing is exciting and dynamic, but in the cold light of day, when you've just got a piece of black vinyl in your hands, the world can look decidedly unfriendly.

Somebody once asked me why all this is necessary and the answer, certainly on one level, is painfully obvious — would you like to find out just how good your favourite band were? Would you not be just that teeny weeny bit annoyed at forking out over four pounds for — well, a load of rubbish to put it mildly. Wouldn't, for instance, a record that sounded a bit 'better' seem better value? Well, there you have your answer. And the cheating goes on, and, quite frankly, there doesn't seem to be any end in sight.

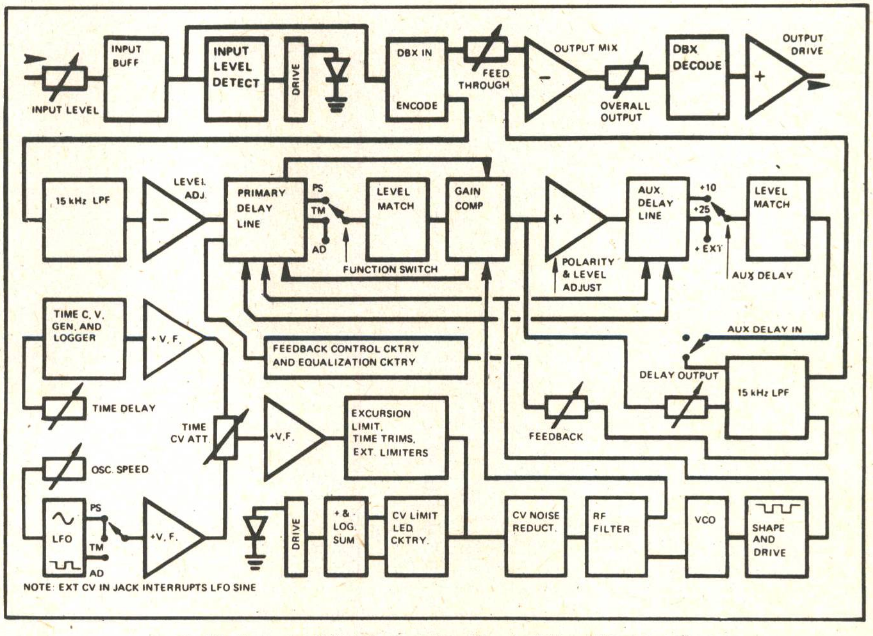
Everyone wants to make that 'better' record and win your custom. Some choose crossed-pair recording techniques, others use the direct-cut process. But the majority of studios compete in the multi-track race for effects. Last year it was thirty-two tracks; this year there's talk of seventy-two being used. Where will it all end? That's anyone's guess. Probably video discs or digital recording will soon pave the way for new recording techniques, but I very much doubt if that's going to mean an end to the current philosophy. Just think of it, with lower noise figures and less distortion we could end up see *hundreds* of tracks being used, not two!


Phasers and flangers from the MXR range


EMT reverberation plates and echo devices

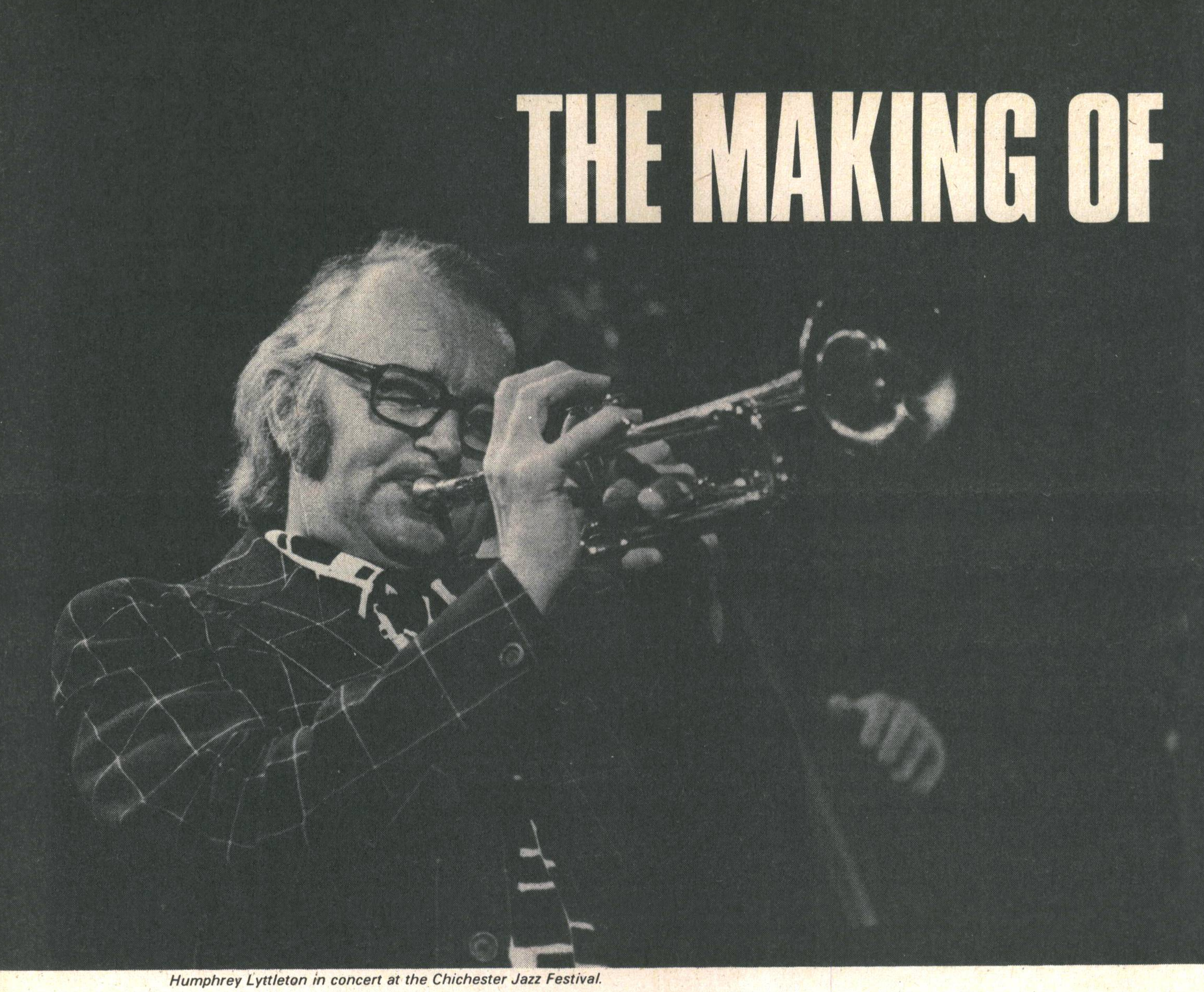


Digital delay from DeltaLab



Inside just one 'black box' — the Marshall Time Modulator!

THE MAKING OF



Humphrey Lyttleton in concert at the Chichester Jazz Festival.

HIGH-FIDELITY, a curious word and an even more elusive quality. On the one hand it applies to anything 'better' than a radiogram and on the other, a whole battery of measurements and specifications. Some people have become so intensely distrustful of the term they've opted for alternatives — emotion, musicality, 'ambience', 'atmosphere' and so on. In the studio world, hi-fi, in the sense of 'a hi-fi mix' is a derisory term implying lots of highs and lows but little musical substance.

It doesn't matter if you've spent £300 or £3,000 on your system, just around the corner there will always be a smug, little know-it-all who'll proclaim with great relish that either he's read of something better, heard of something better or more usually, got something better.

A lot of the problems stem from the fact that very, very few people actually know what they are listening to. Being able to tell good from bad is one thing, making pronouncements about accuracy is an entirely different ball-game. And accuracy is what high-fidelity is all about. Accuracy to the original master lacquer, not the musical instruments, not the microphone's signal, not even the master tape or the original monitor loudspeakers.

What the cutting engineer has created in the groove is all you can ever hope to retrieve at the reproducing stage. Beyond that you are to all intents and purposes in the lap of the gods. Before you can talk about accuracy to the 'original' (and that goes for classical music too) with any sort of authority you need the answers to a lot of relevant questions. For example, was the disc cut exactly as per the tape? What equalization, limiting and signal processing was used? What type of lacquer and of what age and batch?

Did the producer and engineer want to capture the live sound exactly? If not, in what way was it adjusted? What microphone technique was employed and under what acoustic conditions? And so on and so on.

In the end there just seem far more questions than anyone has answers and one is almost tempted to say forget the whole crazy business and just go out and buy anything that sounds reasonably okay. That's fine until you start having niggling doubts again that it may not be quite 'accurate' or as detailed as it should be. And hey-ho it's off on the merry-go-round once more.

Then there's another side to the coin — do we want accuracy anyway, or is what we're really after just some 'souped-up' session of the real thing — a kind of sliced-loaf and fizzy beer hi-fi that is seemingly good for you on the surface but in fact never reaches the parts the real thing does? It's not an easy question to answer — there are all kinds of other considerations as I found out on a recent recording session.

During last summer I was approached by Magnus Records: would I be interested in producing an album? The basic philosophy was simple: as close to the original performance as possible. I liked the idea, and agreed. Then the heartaches began. If there's one thing a producer likes it's absolute control — a kind of megalomaniac need to get all the tiny loose ends tied up together. That's why multi-tracking is so attractive, you can keep on adding bits, improving it, re-shaping things, getting it just right. But multi-tracking was out. Two many phase-problems, loss of detail and, of course, no natural balance. It had to be a two-microphone technique.

In the end we settled on a dummy-head recording. Now as you probably know dummy-head, or to give it its correct name, binaural recordings are made using two identical omni-directional microphone capsules spaced apart in imitation of a pair of human ears. In most cases the microphones are implanted in the ears of a lifesize model head, the theory being that the microphones will pick up sound in more or less the same way as we do.

Quite an eye-opener!

There's only one problem — our brain can reject information the ears pick up — the dummy head can't, so you have to be very careful about exactly where you place it. There are compensations, however, the major one of which is the incredible depth and ambience of the recordings when replayed over headphones. It's quite an eye-opener to hear the difference in apparent depth between headphone and speaker reproduction.

SECRETS OF THE RECORDING STUDIOS
Part 2

MAGNUS RECORDS

ACCURACY, fidelity, the real sound, true to life or true to live? Are we so used to the subtle and the not so subtle manipulations of the record industry that live sound is pale by comparison? asks Carl Anthony

Although we had decided on a binaural recording technique this wasn't to be the sole object of the exercise. The idea was to try and capture the musicians with as little interference as possible. With this in mind the only electronics between the microphone and the tape recorder were a pair of mic amplifiers and some treble and bass eq., the former to tailor the mic's response and the latter to control the room acoustics.

Two separate performances were recorded for each of the two albums. I would like to have said it was easy. That we just put up the gear, switched on and sailed through it without a care in the world. Hardly: by the end of it I think I must have aged twenty years, lost half my hair and given myself God knows how many near coronaries!

In a studio you've always got the chance to have another go. A live gig is a whole different story. It's for once and for real and recording straight down to stereo there is little margin for error. With binaural you can't even tamper with one channel or overdub later or otherwise the whole 360-degree sound-field goes for a burton.

Even recording two performances in the end left us very little material to play with. The Humphrey Lyttleton album, *Humphs About* (Magnus 1) was easier in that they played acoustic instruments with very little sound re-inforcement. Paz (Magnus 2) on the otherhand were not only playing with electric/acoustic instruments but also using a fair amount of PA which resulted in some very weird effects *via* the headphones. One minute the electric piano was on the left, then it would jump to the right as the PA level was increased then finally dart back to the left again. The acoustic piano would be on one side one minute, then the full width of the stage the next! Sadly we had to lose a couple of tracks because of this. Possibly the audience weren't too aware of what was happening (that brain again) but it was all too obvious on the rejected takes.

With so much equalization on electric instruments these days one tends to forget just precisely how they sound 'au natural'. It can take some getting used to especially if you live on a high diet of studio sounds. The same applies to drums. As far as hi-fi is concerned I firmly believe that it is far more important to capture the performance as it is performed with all the odd knocks, bumps, creaks and groans (that is in every sense 'real') than obliterate everything with noise-gates, special filters and limiters etc. For this reason none were used.

Beyond the bounds

It's very tempting when recording a musician to 'improve' the sound. At times it was hard to resist, but we had set our aim at trying to capture the sound with as much fidelity as possible. In a way it meant a re-appraisal of our entire listening experience. Studios have taken the creative aspect of recording far beyond the bounds of the real-life situation. What would happen if we got out there and captured things just as they happened? The results were both frightening yet incredibly revealing.

People who have a reasonable familiarity with live music tended to see the album in terms of performance, musical timbre and dynamics. People more attuned to their hi-fi systems discussed it in terms of subjective loudness levels of instruments and frequency response.

The interesting thing is that equalization and stereo panning are the forte of the modern studio. Creating an artificial sound-field where instruments are all equally clearly defined both in the two-dimensional speaker-to-speaker context and also in terms of re-defined apparent loudness is the norm many people have come to accept.

At a real-life concert (without a PA system) there's no speaker-to-speaker frame of reference — it all happens in three dimensions, so perceived loudness is a function of the distance between the musician and the listener, the intensity of the playing, and the dynamic range of the instruments. There are times when a quiet instrument will be totally inaudible and indistinguishable from the overall level of the other performers. This is fairly normal and happens all the time. If you artificially raise the level of the performer you distort the truth. On the Magnus recordings, rightly or wrongly, we endeavoured to use this three-dimensionally in order to capture a natural, more accurate balance. Whether the result is more satisfying to listen to is for the listener to decide but in the end quiet instruments sound quiet and distant instruments sound distant. The aim was not to make a better or more accurate sounding 'studio' album which has been the trend with many direct-cut discs. The aim was to capture a live performance.

Because of this you won't find much bass on the albums. Personally I would have preferred more bass but the on-stage line-up necessary to achieve it naturally, would have meant placing the bass-player centre front, soloist behind him and drums behind the soloists: not a particularly satisfactory compromise for either the musicians or the audience.

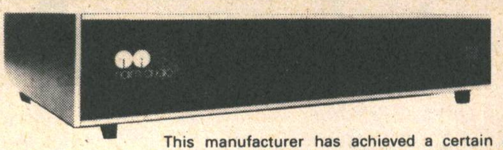
As a producer what excited me most about hearing the playback both off tape and subsequently off disc was the fact that it is possible to capture a performance in a very real sense. Years of listening to studio albums — which I like and can still enjoy — had created a different expectation level. When you capture the sound a musician creates (rather than a studio) there's an undefinable vitality about it, and you are rewarded with all kinds of nice little nuances normally lost. The most obvious thing is dynamics. Playing more intensely creates more volume and this is one thing that is normally lost. With the Magnus albums this is one thing I've tried to retain. But it's not without its problems. Replacing a blown cutter head is very expensive and Gerald Reynolds of Nimbus Records Ltd., where the albums were cut and pressed, had more than his fair share of problems. I have the greatest respect for him. With all limiting taken out of the cutting chain it takes a fair bit of nerve (and experience) to know just how far to go. Our initial test pressings were hum-dingers and forced us to reconcile our objectives.

Nothing apart from a Shure V15/III would track the groove with anything like positiveness. Most just broke up into the most excrutiating sound imaginable. So much for trackability — cartridge manufacturers still have a long way to go to match the cutting capability of the Neumann equipment. So we dropped the overall cutting level. Even so I'd still maintain you need to have your equipment set-up correctly to securely track the album. There should be no break-up during the 'heavy' passages and if you experience any distortion I would suggest you check your stylus alignment.

The Humphrey Lyttleton album is interesting in another way as well. Because it is basically an acoustic album with very little eq added it is very easy to spot system coloration with it. In fact in many ways the typical colorations fond in cheaper equipment tend to 'fill-in' some of the more ambient spaces and create a seemingly smoother sound.

These early albums are a tentative first step towards putting the musician back in his rightful place. There are plenty of problems to overcome but I believe the rewards in the end with respect to musical satisfaction will be immense.

SPALDINGS



This manufacturer has achieved a certain charisma, notoriety, call it what you will — it can all be summed up in a few words. A design criteria which creates a large band width of ambience without loss of musical information — a must for serious audiophiles.

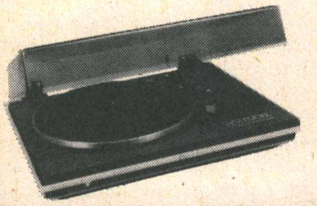
naim audio

LP12 | LINN SONDEK

Now featured and available
LINN SONDEK LP12 with the amazing *NEW* LINN ITTOK LVII Pick-up arm with ASAK m/c cartridge.
In stock the *new* Supex SDX 1000 m/c cartridge.
Also on demonstration Linn Sarah loudspeakers and Linn Isobariks

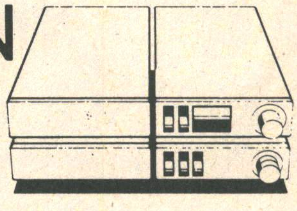
352-4 LOWER ADDISCOMBE ROAD,

SYSTEMDEK



The Dunlop Systemdek is a superbly manufactured, transcription unit comprising a pressed-steel and aluminium sub chassis which supports possibly the heaviest platter on the market today — a staggering 10½ lbs. (This platter comes fitted with a felt mat).
Systemdek have incorporated a special bearing designed to ensure a continual oil film so that metal to metal contact is eliminated and hence rumble.
The unit is finished in a tasteful chocolate brown coloured Nextel material giving a velvet feel. It can be combined with most pick up arms, and we have this precision unit in stock and on permanent comparator demonstration in our showrooms.

MERIDIAN

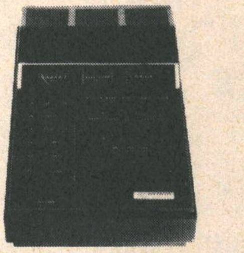


A clean full sounding range of equipment with a distinctive appeal of its own — coupled with an aesthetic appearance second to none. Listen and complete your enjoyment of sound.
New Meridian 105 in stock now.

CROYDON SURREY.

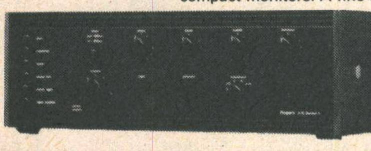
NYTECH AUDIO

Major Features
★Moving Coil input facility with interchangeable input cards for most moving coil cartridges.
★Pre Amp Output/Power Amp Input allowing use of external high power slave amplifiers (e.g. NYTECH CPA 602) and active loudspeaker cross-over systems.
★Preset F.M. Tuner.
Available shortly the CTP 102 Tuner Preamp and the CPA 602 Power Amp.



Rogers
BRITISH HIGH·FIDELITY

The A75 II, a first-class amplifier built to a high standard at a very reasonable cost.
Now in stock — the new A100 Amplifier.
Also available Rogers loudspeakers including the LS3/5A a much acclaimed BBC design manufactured to a high standard and their export and compact monitors. A fine range indeed.



TEL. 01-654 1231 or 01-654 2040

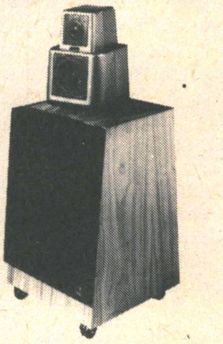
mission ELECTRONICS

We are pleased to have in stock and on demonstration the full range of high fidelity components from Mission Electronics. Pictured above is the superb 770 loudspeaker, a two-way unit utilising the advanced polypropelene cone material and dampings as recommended by the BBC. This enclosure is manufactured for the discerning 'audiophile' and offers least coloration possible, amazing dynamic range and distinct stereo imagery.

A&R CAMBRIDGE

This economically priced amplifier constructed without cutting any corners, gives you everything you would expect to find in units costing much more, high sound quality, ease of operation, modern styling and extreme reliability. Acclaimed by the Hifi Press over the past two years and as much in demand by the public as ever. The T21 stereo tuner was primarily designed to match the A60 Amplifier though it is at home in most hifi systems. The operation of this unit is simplicity itself. There is no complicated tuning scale on the T21. Instead, a row of 21 LEDs (light emitting diodes) spaced at precise IMHz intervals operate to produce an accurate and stable tuning scale. Signal strength is also indicated by LEDs which show sufficient acceptable levels of signal for both mono and stereo reception. An LED tuning meter ensures that the station is precisely on tune. Both these exceptional units are available for audition in our showrooms NOW.

KEF



Brand new from KEF is the Model 105 Series II a 3-way loudspeaker system embodying a number of new and original design features.
The middle and high frequency units are housed in a separate 8.5 litre enclosure which is mounted on top of a 70 litre low frequency enclosure. During manufacture of the Model 105 an advanced computerised matching and grading procedure of both drive units and dividing network components is used.
Model 105 can provide concert hall listening levels in the home using amplifiers with up to 200 watts output. A self powered electronic circuit, S-STOP, protects the loudspeaker against the effects of accidental overloading.
We also stock the rest of the superb range of KEF loudspeakers.

SURREY'S HI-FI AND VIDEO CENTRE

SPALDINGS *offer the above items plus the following, all of which are on permanent demonstration in our showrooms:*
Naim, Linn Sondek, Spendor, Celef, I.M.F., Meridian, JBE Turntable, Nightingale, S.M.E., Rogers, Revox, S.T.D., T.V.A., Sugden, Quad, B.&W., Gale, Lux, Grace, Harbeth, Denon, K.E.F., A.T.R., Technics, Mission, Akai, Pioneer, Sansui, Mayware, Syrinx, Michell, Radford, Ariston, Thorens, Profile, Mordaunt Short, Reference, Philips Black Tulip.
Also Cartridges from:
Ultimo, A.K.G., Supex, Satin, Entree, Denon, Ortofon, Stanton, Grado, Decca, Shure, Koetsu.
Plus a range of direct cut records. All Accessories, Leads, Tapes, etc.

VIDEO New Machines by National, Sony, Philips, J.V.C., ex-stock.
CLOSED WEDNESDAY
Late night closing Tuesday — 8 p.m.
Personal Export Enquiries Welcomed. Extended credit arranged.

SECRETS OF THE RECORDING STUDIOS
Part 3

Looking in on ECM

ECM Records was originally created by Manfred Eicher in 1969. The name stands for *Edition for Contemporary Music:* it also stands for exceptionally fine jazz coupled with superlative recordings and pressings. As far as conventional record companies go (as opposed to the direct-cut and super-fi labels) they maintain consistently standards of the highest possible quality. Pundits who claim a commercial operation can't be quality-curious should take a closer look at ECM.

The first record ECM produced was Mal Waldren's *Free At Last*. Today they have over two-hundred titles in their catalogue. Keith Jarrett is of course in the hi-fi world, a household name but there are a lot of other artists and albums that are just as impressive (Paul Motian Trio, Egberto Gismonti for example). In fact it was because of the stunning quality of one of these albums (Paul Motian) that made me pack a bag and head for the Black Forest region of Germany to talk to Martin Wieland, one of a very select group of engineers used by ECM.

Although ECM are based in Munich, Manfred Eicher (who also produces all the ECM records) does all the re-mixing and a large amount of recording at Tonstudio Bauer. It's a modern studio, superbly equipped and an ideal location for making good jazz music. The main studio is quite large (it will accommodate up to sixty musicians and a choir) but nevertheless has a warm, intimate feeling. In one corner stands the original Horst Jankowski used for his million-seller, *A Walk In The Black Forest*.

One of the first things I wanted to know about ECM's recording philosophy was, what was the fundamental principle of their recording technique. Martin was very clear about it:

'Once the musicians have warmed-up I go and listen to exactly how the instruments sound in the room. I then try to translate this over mics and lines on to tape. We use as little eq as possible'.

This doesn't mean ECM records simply in stereo. Most of the work is recorded on to sixteen tracks and each instrument could have as many as four microphones picking up the sound.

Ironically it's the natural sound of the instruments which determines how many, and where the microphones are placed. Depending on the client or the type of music the drummer may be in a separate isolating booth or in the main studio. Despite the usually amazing drum sound nothing particularly special is used in the way of microphones or recording technique.

At the end of the day it's down to making the musicians feel comfortable and not keeping them too far away from each other. In the studio they are more or less set up as they would be on stage.

In order to preserve the natural tonal qualities of the instruments there's little opportunity to use a simple stereo microphone arrangement. In classical music instruments tend to be fairly evenly balanced and where they are not instruments are doubled-up or used in groups of four, six, eight or more to bring up the overall level. An acoustic bass cannot compete with a drum-kit in terms of level hence the need for separate microphones. If the bass player tries to play louder the tone will become harsh.

'What', I asked Martin, *'takes up the most time, recording the multi-track tape or re-mixing?'*

'In general it should be "pre-mixed" as it goes on to the multi-track. It's impossible to just let each instrument go on to one track and just leave it at that. In most cases when you are making the initial multi-track recording you should know how it's going to come out later on,' replied Martin. *'We talk with the musicians beforehand and I've now been recording with EMC for ten years so it's not difficult' to know in what direction the musicians want to go.*

Many records and titles are captured on the very first take. A typical recording session for example would last two days. There'd be two sessions of eight or nine hours then the third day would be used for re-mixing. This would be for one album. And if you think that's a long time consider the fact that the average time for an album is two to three weeks with some super stars taking as long as eighteen months.

One particular album Martin worked on was the now-famous *Koln Concert* by Keith Jarrett. I asked him how it had been recorded.

'It was a really, really simple, two-mic technique, recorded live, straight to stereo. The piano was very small and Keith wouldn't play at first but the acoustics of the hall were nice and we persuaded him to do it. And that's the record.'

In view of the claims of a certain Scottish turntable manufacturer (and the counter-claim of some cynics) I just couldn't let the opportunity go by of asking to what extent you could hear Keith Jarrett singing (some people have to have it from the horse's mouth before they'll believe anything!)

'He's singing most of the time', replied Martin, *'especially when he stands up and he's playing, bending his body — especially at a concert. In this case he's always singing.'*

Better get the album out and have another listen and see if you're still cynical (or need a new turntable)!

And finally what was it that Martin felt personally made a good record?

'If I listen to a record and I feel something in this record and I can listen the whole way through — mostly I stop in the middle because it gives me nothing, but if I can listen to it all the way through then I know it's well recorded and there's good music on it.'

'And the function of a good engineer?'

'I try to understand the musicians and try to translate their music on to tape'.

And that's probably why Manfred Eicher and ECM have got where they've got today.

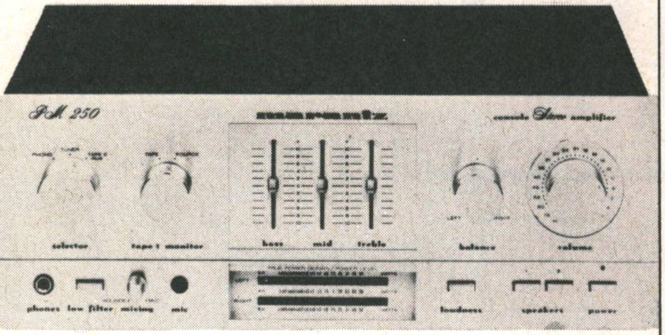
ECM records are pressed in Germany (at Deutsche Grammophon) and are available as imports from IMS (Import Music Services). For a list of ECM (and JAPO) albums write to: *Import Music Services, 17-19 Stratford Place, London W1N 0BL.*

Carl Anthony

sounds in short

reviewed by GEOFF GILES

MARANTZ PM250 amplifier



THIS is another low-powered, low-cost amplifier that's worth considering as not only is it well made, it is also capable of a very acceptible sound quality when partnered by loudspeakers of reasonable sensitivity, or 'efficiency', as it is sometimes called.

The specification of the Marantz PM250 is a good one and states a power output of 25 watts per channel into eight ohms which should be sufficient with the majority of loudspeakers available but one should steer clear of those of low sensitivity as this would mean driving the amplifier too near the point of clipping, even in small rooms if a decent sound level is required.

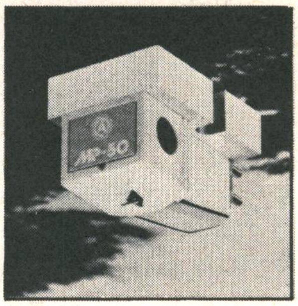
At home, the amplifier performed very well but I was a little surprised how high the volume control had to be advanced when used with the built-in loudspeakers which are used as a reference. These are quite sensitive by modern standards and generally produce a lot of sound from relatively low powered amplifiers. The sound quality certainly isn't lacking though and once again I was reminded how good many of today's low-priced amplifiers can be — the PM250 included, of course.

The facilities offered are above average and include switching for two pairs of speakers, a low, or high pass, filter, loudness control, tape monitor, a microphone input with its own mixing level control and unusual in this price range, *three* tone controls. We're all used to the normal bass and treble controls and the effect they have at the extremes of the audio range, but a mid-frequency control which the PM250 boasts is, in many ways, considerably more useful since it can more dramatically alter the perspective of performers than either the bass or treble controls, I give the PM250 a definite bonus point on this score!

Another 'extra' is a pair of led bar graphs which display the power output of each channel and whilst the rapidly flashing lights may be initially impressive, I really cannot see the need for such on any amplifier, except, perhaps, those used in professional studios. It's a small point, I agree, but the number of watts being produced by any amplifier is much less important than how good (sensitive) a loudspeaker is at converting the power into sound.

For £89 or so, the PM250 represents good value for money and it joins the list of budget models we're happy to recommend.

NAGAOKA MP50 cartridge



THE name of Nagaoka isn't one that immediately springs to mind when thinking about cartridges, but if this sample from their range is anything to go by, this newish brand name will have little difficulty in firmly establishing itself. Designated the MP-50, it is the top model of the manufacturer's MP Series, which includes five other cartridges, and cost around the £70 mark, or for another £10 or so, it can be supplied complete with a substantial magnesium alloy headshell.

For this review, the cartridge came without the optional headshell and spent part of the listening period in an SME Series III arm fitted to an Ariston RD11 turntable and the other part with a Denon DP-30L record deck. With both turntable assemblies there is little doubt about the MP-50's inherent qualities and at a playing weight of just under 1.5 grammes, tracking ability proved very good indeed although it was at its best in the SME arm.

This comparison proved most interesting because although the MP-50 sounded excellent in the Denon and produced the sort of quality which would please almost everyone, when fitted to the Ariston/SME assembly an added sense of clarity and ambience was apparent with complex orchestral/choral textures being rendered slightly cleaner and better defined.

Perhaps it is not surprising considering that the Denon record deck is around half the price of the Ariston with SME fitted, but it does reflect the importance of good cartridge/arm/turntable interface and why we constantly recommend attention be paid to this aspect.

DENON DP-30L

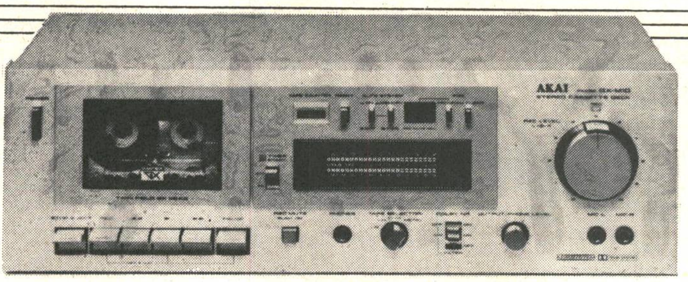
STYLED in a similar fashion to its up-market cousin, this new Denon DP-30L direct-drive record player comes complete with a good quality pickup arm and boasts semi-automatic facilities which for many people are highly desirable. It is nicely-made, looks unobtrusive, works in a positive and silent fashion and, fitted with a suitable cartridge, produces the sort of sound quality which is more than acceptable. Speed accuracy is ensured by servo control and there's a stroboscope included. This is viewed through a small window just in front of the platter and, like an increasing number of turntables these days, rotation speed, at either 33⅓ or 45 rpm may be varied upwards or downwards by over three per cent; a useful feature for those conscious of precise pitch.

All in all, a well-presented record deck which once more had me wondering why so many people tolerate the fiddly business associated with manually operated turntables with the constant risk of damaging either stylus or record, or, at worst, as I confess to doing, both. But, as ever, it is horses for courses with direct-drive turntables to the out-and-out enthusiast being almost as abhorant as transistors are to the valve amplifier fanatics.

— a new Practical Hi-Fi service to make sure we review the maximum equipment for you; we're adding these brief, subjective, monthly tests to our normal comparisons, system reviews and laboratory evaluations

The nominal output quoted by Nagaoka for the MP-50 is a little on the low side at 2.5mV (5cm/s), if compared with most moving magnet cartridges, but such sensitivity will match in well with the majority of modern amplifiers and it will be necessary to advance the volume control a little more if auditioned against some other quality cartridge for a comparable sound level. That, by the way, is not a criticism but merely a passing comment.

In every respect this new cartridge is a welcomed addition to the already fine range of cartridges we have available and is one which I find particularly rewarding inasmuch as its ability to extract detail from discs places it high up the ladder of fame. A lot, however, will depend on the quality of turntable and arm it is used with if it is to give of its best. On both the Ariston/SME and the Denon it was excellent, scoring the highest marks with the former, and doubtless it will also do justice to many other fine turntable and arm combinations but only time and experimentation will tell. In the meantime, add the name of Nagaoka to your list of contenders and see how *you* like the MP-50 as that's what really matters!



AKAI GX-M10 cassette deck

AT a modest retail price of around £150, this new Akai GX-M10 cassette deck has a lot of star features and is likely to prove very popular. What's surprising for the price is that not only is the deck metal tape compatible, the usual VU meters have been replaced by faster reacting FL (fluorescent) bar type meters; a single control, instead of two, covers both bias and equalization; a record mute switch has been introduced in addition to a pause control and to top it all, a memory/IPSS (Instant Programme Searching System) is incorporated. Quite a package by any standards!

Close inspection of the GX-M10 to see what, if anything, has been sacrificed in order to add rather unusual features for a cassette deck in this price bracket, revealed nothing of significance except the usual metal case has been replaced by a well-made plastic one. In all other respects the GX-M10 is beyond criticism and is both neat and functional in appearance.

In use the machine proved very straightforward with all controls functioning smoothly and positively and special note was made of the ease by which the piano-type keys could be depressed. Some cassette decks I've used have been pretty awful in this respect and required near finger-breaking pressure to depress them.

Recorded quality using ferric and chrome tapes from BASF and Scotch produced some fine results but it was the deck's metal tape ability which beckoned for the closest attention. Using both Scotch Metafine and Fuji metal tapes, the recorded quality was certainly impressive and subjectively better than that obtained from 'ordinary' tapes but the differences are more subtle than striking and depend on the quality of the programme source. In this respect, I entirely agree with Gordon King because whilst this new recording medium offers proven advances — especially at high frequencies — over ferric and chrome tapes, the high cost of metal cassettes should be borne in mind. Personally, I would reserve the Akai's metal tape facility for those special occasions when the last ounce of recorded quality is desirable and the cost factor is irrelevant, and use good quality ferric or chrome tapes for normal entertainment purposes.

The GX-M10 offers an awful lot for the lowish price tag and it's obvious from the data submitted by Akai that the deck has been built to perform well and most importantly, have a long life too.

turntable

However viewed by the enthusiast, for the majority of people a turntable is just what its name implies and is merely required to rotate a record at the correct speed and add nothing objectionable of its own in the way of rumble or wow and flutter. The DP-30L in this respect, puts in an exemplary performance and with its degree of semi automation is representative of the way basic turntable design has of nature had to develop and is likely to continue until the bursting forth of the digital disc heralds the beginning of a completely new era and different type of 'player' altogether.

Cartridges chosen were Shure's proven and consistent M75ED and the slightly up-market Ortofon VMS20E. Both produced the sort of quality which could not be described as being other than enjoyable and confirmed the feeling that the majority of mid-priced cartridges would suit the DP-30L very well, but as ever with the proviso that cartridges and record players need auditioning *together*.

Costing somewhere in the region of £140, the DP-30L, with its semi-automatic facilities and variable speed control, plus the fact that it's direct drive, is likely to attract deserved interest.

Tone controls and equalization

explained by Brian Dance

ALL HI—FI systems incorporate circuits which amplify different frequencies by different amounts. In all cases these circuits should operate at a relatively low signal level in order to minimise the risk of overloading and distortion, so they are incorporated in the pre-amplifier unit.

A circuit which amplifies all audio frequencies by the same amount is said to have a 'flat' or a 'level' response, since when the amplification is plotted against frequency, one obtains a flat, horizontal straight-line graph. There are a number of uses for circuits which do not have a flat frequency response in audio equipment, some of the main applications being in recording and replay frequency-response equalization circuits, in tone control circuits and in filters.

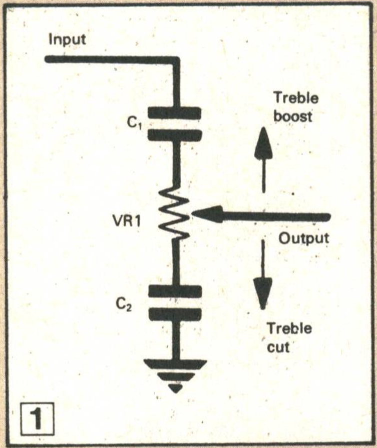
If a conventional disc recording is replayed, it is necessary to amplify the various frequencies by different amounts in the pre-amplifier in order that the resulting audio signal used to feed the loudspeakers shall produce a sound similar to that in the recording studios. This use of different amounts of amplification at various audio frequencies to correct the response of the system is known as 'equalization'.

Other forms of equalization are used when a magnetic tape recording is being made and when it is being replayed.

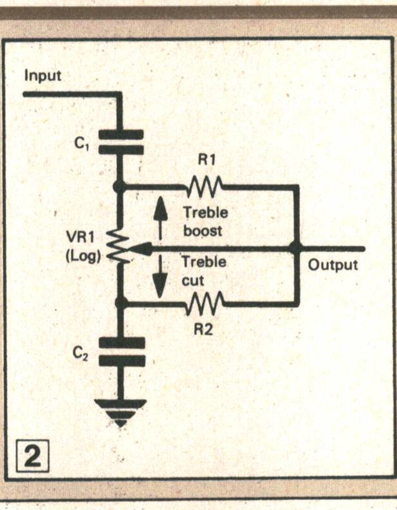
Tone controls are used to increase or decrease the relative amounts of treble and/or bass amplification in a system. Although one may put forward a case for employing a 'flat' frequency response (except in the equalization circuits) so that the relative amounts of bass and treble are the same as in the sound at the studio, some people prefer to emphasise the bass, others the treble and their frequency response requirements vary from one recording or radio programme to another.

In addition, it may be desirable to provide facilities for altering the frequency response somewhat in order to provide the most pleasant sound in a room which has very different reverberation characteristics from that of the recording studio. If the loudspeaker is not of the highest quality, this may be another reason for using a system with a frequency response which is not flat.

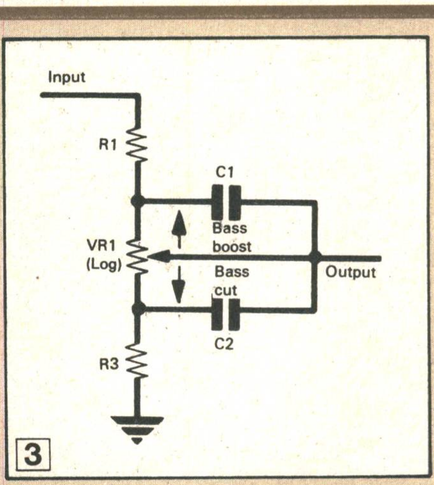
These requirements can be met by the provision of tone control circuits which raise or lower the amplification of the treble or bass frequencies by adjustable amounts relative to the amplification at a certain mid-frequency (usually taken as 1kHz).



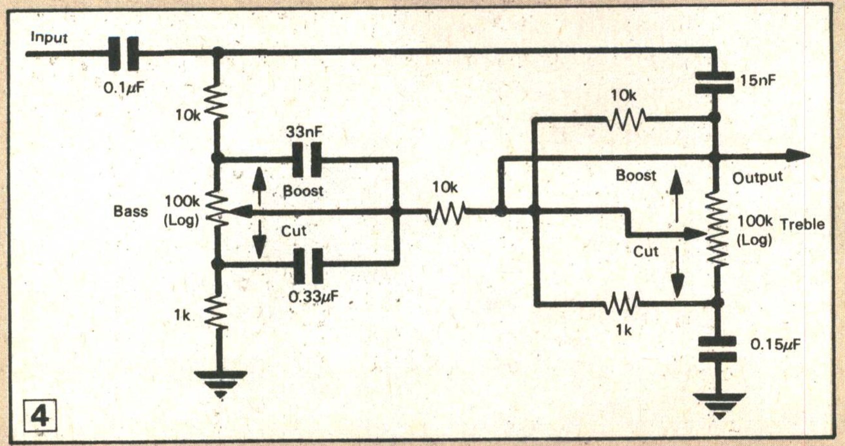
1



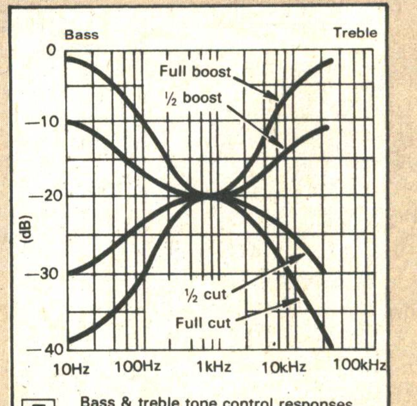
2



3



4



5 Bass & treble tone control responses

Undesirable interfering noise may be present in the system together with the required signal and in some cases a suitable filter can greatly reduce the level of such interfering noise. For example, a rumble filter can by used to remove the low-frequency rumble associated with the use of poor-quality or worn mechanical equipment for the turntable or tape transport mechanism. Similarly a 'scratch' filter can be used to reduce the amplification at very high frequencies and hence to remove much of the high-frequency noise which is so prominent in the old 78 rpm recordings.

We will now consider these applications of frequency-selective circuits in more detail together with various practical circuits which can be used to provide the required frequency response. In general the circuits discussed will involve integrated circuits (for simplicity). Practical circuits with component values will be used to illustrate the principles involved so that those readers who wish to do so can proceed to construct the circuits. However, it must be pointed out that the design of the circuits involves much manipulation of equations — apart from practical testing — and this lies outside the scope of this discussion.

Let us first consider some simple, passive tone control circuits. A passive circuit does not contain any active (amplifier) devices, but consists merely of a network of resistors and capacitors. The circuit of a simple passive tone control which provides both treble boost and treble cut is shown in *Fig. 1*. As in the case of most tone control networks, its operation is based on the fact that the impedance of a capacitor becomes smaller as the signal frequency increases. (Impedance is in many ways rather like resistance and is measured in ohms, but applies to capacitors and inductors and not merely to resistors.)

The two capacitors have a relatively small impedance at high frequencies and form a voltage divider with the resistor VR1. If a high-frequency signal is applied at the input, almost all of the signal voltage will therefore appear across VR1, very little signal voltage appearing across either capacitor owing to their low impedance. At lower frequencies, however, the impedance of these capacitors is much greater, and an appreciable fraction of the input voltage will appear across each of them, so that the fraction of the signal appearing across VR1 is not very great.

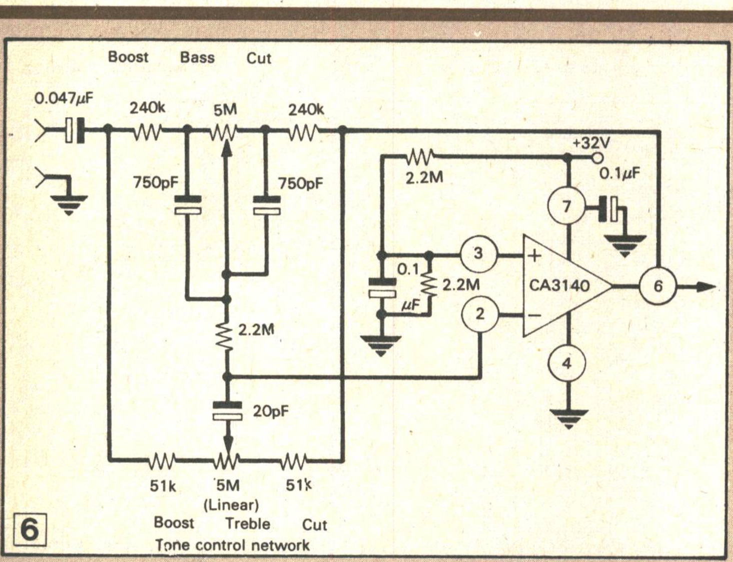
If the slider of VR1 is near to the top in the treble boost position, almost the full input voltage will appear at the output when the input signal has a high frequency. In the case of a low-frequency signal, however, much of the signal voltage appears across C1 and the fraction of the input signal reaching the output is much smaller. Thus the treble is boosted relative to the bass.

Similarly, when the slider of VR1 is at the lower end connected to C2, the appreciable output voltage at the lower frequencies present across C2 will appear at the output. As C2 has a low impedance at high frequencies, little of the signal voltage will appear across it at such frequencies. Thus one has treble cut.

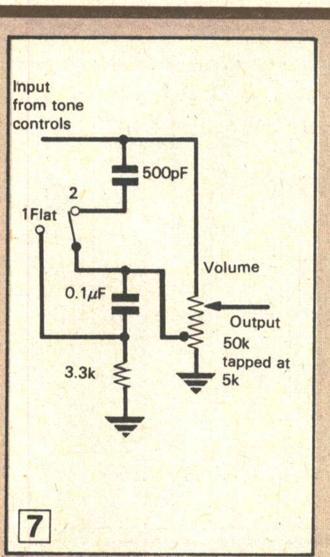
Unfortunately the simple circuit of *Fig. 1* is far from ideal, since the frequency at which the treble boosting commences is much lower than that at which attenuation starts in the treble cut position. This problem can be avoided by the use of the circuit of *Fig. 2* which provides treble boost or cut with both facilities commencing at the same frequency.

A similar circuit for bass control is shown in *Fig. 3*. In this circuit C1 in series with C2 provides a low impedance at high and middle frequencies, so the signal voltage across VR1 is smaller at these frequencies than at low frequencies. Thus if the slider of VR1 is raised towards the point of connection with R1, the relative level of the bass frequencies will be raised; similarly, when the VR1 slider is near to the lower end of its travel in *Fig. 3*, bass frequencies will be attenuated.

A complete passive bass/treble tone control circuit is shown in *Fig. 4*; this circuit provides the frequency response shown in *Fig. 5*. Either the bass or the treble can be raised or lowered by up to about 20dB at 10Hz and 20kHz respectively relative to the standard



6



7

Fig 1: *A simple treble tone control circuit using only passive components.*

Fig 2: *A better treble tone control circuit using two extra resistors.*

Fig 3: *A passive bass control circuit.*

Fig 4: *A complete passive tone control circuit for bass and treble control.*

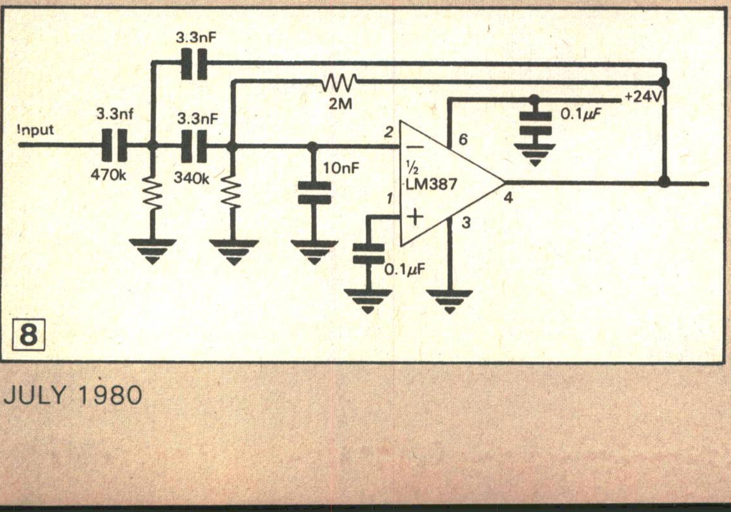
Fig 5: *The response of the* Fig. 4 *circuit at various control adjustments.*

Fig 6: *An active tone control circuit of the Baxandall type.*

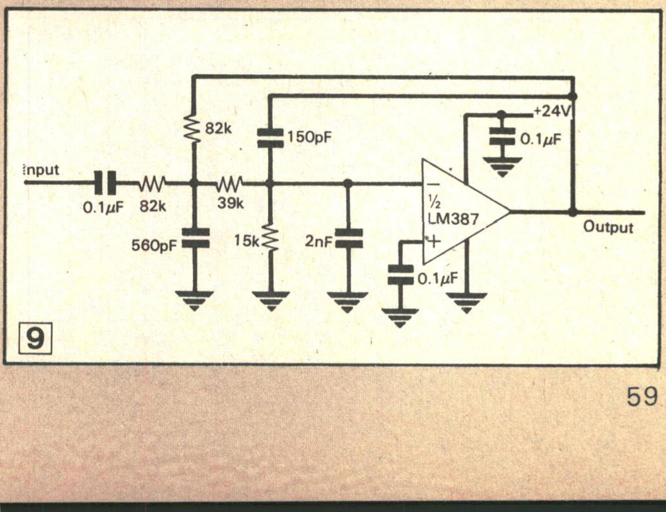
Fig 7: *A loudness compensation circuit.*

Fig 8: *A rumble filter using the LM387 device.*

Fig 9: *A scratch filter (low pass) using the LM387.*



8



9

Tone controls and equalization

1kHz reference frequency. This is more than adequate for any normal application.

Although this type of circuit is very simple, it has some disadvantages. In particular, as it contains no amplifier device, it can only provide an output at any frequency which is smaller than the input at that frequency. The boost at any frequency is only relative and really means a smaller loss. Thus a circuit which provides a 20dB treble boost must reduce the bass signal level by no less than 20dB. A passive circuit which provides 20dB of treble boost followed by 20dB of bass boost will have an insertion loss of 40dB at mid-frequencies. Passive tone controls should therefore be employed with an amplifier which will make good the signal amplitude lost by the use of the passive circuit. Generally the amplifier stage should precede the tone control stage so that the best signal-to-noise ratio is obtained, but care must be taken to ensure that no signal waveform clipping occurs.

Active tone controls which employ an amplifier with a feedback network offer some advantages over the simple passive network. The feedback in the circuit results in low distortion and the frequency response curves (similar to those of *Fig. 5*) are essentially symmetrical about the horizontal axis.

Perhaps the best known type of active circuit was designed for valve pre-amplifiers by P. J. Baxandall in 1952 — a modern version of this circuit using a CA3140 operational amplifier unit is shown in *Fig. 6*. Although a +32V power supply is shown, smaller values of this voltage can be employed provided that high output levels are not required. This circuit provides unity gain (that is, the output voltage equals the input voltage) at mid-band frequencies and in addition it uses readily available linear potentiometers. As the CA3140 device has a very high input impedance, economical low-value capacitors can be used in the tone-control network.

This circuit provides ±15dB of treble and bass boost or cut at frequencies of 10kHz and 100Hz respectively. The frequency response with the tone controls in their mid-position is flat at up to about 70kHz to within 3dB. Full output can be obtained at frequencies of up to about 20kHz.

This circuit is, of course, only one of many possible active tone control designs.

As the volume level of a programme is decreased, it seems to the listener that there is a pronounced loss of bass together with some loss of treble. This apparent change, due to the characteristics of the human ear, can be compensated by the use of the type of circuit shown in *Fig. 7*. A special 50kOhm potentiometer tapped at 5kOhm is required.

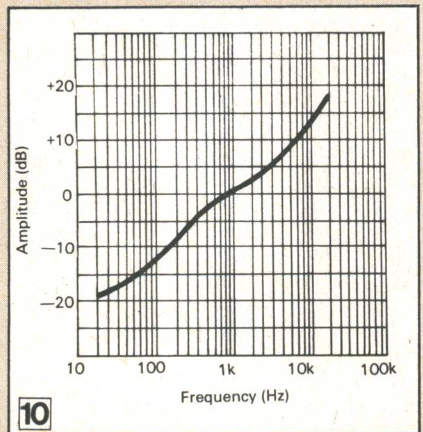
When the switch is in position 2, as shown, the network is in use, but if the switch is put in position 1, the 500pF capacitor is not connected and the 0.1μF capacitor is shorted out so that the response is flat. In position 2, the bass and treble are boosted, but the amount of boosting increases as the volume is decreased so that one obtains the required compensation. As the volume is increased, the slider of the volume control moves farther away from the tap point so that the network has less effect.

A rumble filter using the National Semiconductor LM387 operational amplifier with a feedback network is shown in *Fig. 8*. The frequency at which the response falls by 3dB as the frequency is lowered is about 50Hz with the values shown, the slope of the falling response at lower frequencies being 12dB per octave. The output voltage is approximately equal to the input, but is of opposite phase. The total harmonic distortion is quoted as being not more than 0.1 per cent.

A simple low-pass or scratch filter is shown in *Fig. 9*, this being rather similar to the rumble filter of *Fig. 8*. It provides an output which is −3dB down at 10kHz and at higher frequencies the response falls at 12dB per octave. The total harmonic distortion does not exceed 0.1 per cent and the output and input voltages are equal, but out of phase.

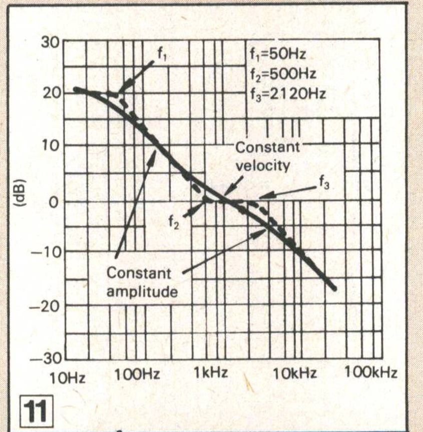
More complex low-pass filters are often employed which have an adjustable upper frequency limit.

When a disc recording is being made, the cutting stylus vibrates from side to side in a pattern which follows that of the signal being fed to the head. This is known as lateral cut as opposed to the vertical cutting technique used in the early recordings. Stereo disc recordings are made using two



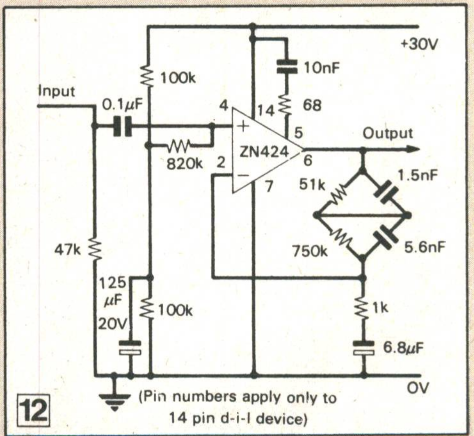
10

Frequency response from a standard recording before equalization.



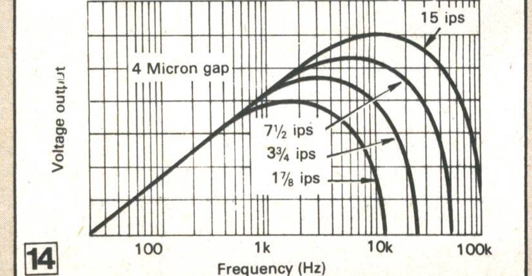
11

The RIAA response for correcting the frequency response from a disc.



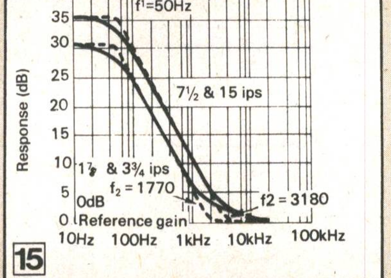
12

A Ferranti magnetic cartridge circuit providing the RIAA response.



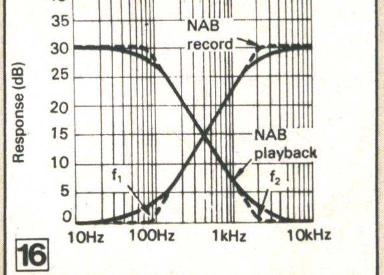
14

Tape replay response before equalization at various tape speeds.



15

NAB curves for correcting tape replay frequency response.



16

The complementary NAB record and replay characteristics.

cutters arranged at right angles to one another, but this complication need not be discussed here.

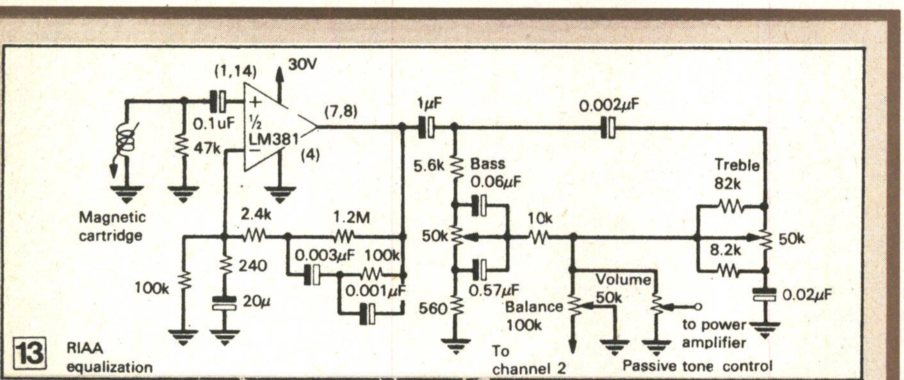
The side or lateral movement of the cutting stylus must not be too great or the cutter will break through into a neighbouring groove, so there is a limit to the maximum signal level which can be accepted by the head. Minute grains in the material of the disc cause small movements of the stylus on replay and this movement is reproduced as noise. These two factors impose a limit on the dynamic signal-level range and on the signal-to-noise ratio which can be obtained from a disc.

The RIAA (Record Industry Association of America) has adopted a recording standard which has become almost universally accepted. If a signal of increasing frequency at a constant level is recorded and replayed without equalization circuits, the output of a good quality test cartridge will increase with increasing frequency as shown in *Fig. 10.* In order to obtain a level overall response for the recording and replay system so that the replayed sound is similar to the recorded sound, an equalization network with the characteristic shown in *Fig. 11* must be employed in the replay pre-amplifier. This is known as the RIAA playback equalization characteristic. The full line in *Fig. 11* is the equalization curve itself, whilst the dotted line indicates how it may be obtained in practice by the use of circuits with 'corner' frequencies of 50Hz, 500Hz and 2120Hz.

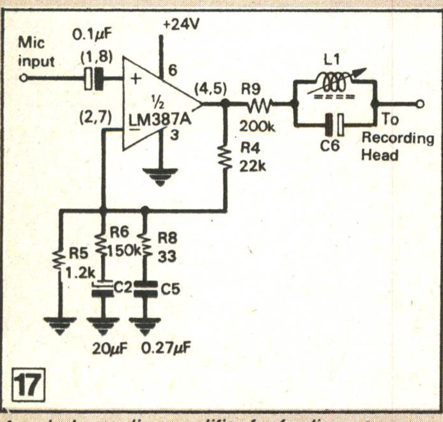
This type of response is equivalent to the use of constant amplitude recording between 50Hz and 500Hz and constant velocity recording from 500Hz upwards. Above 2120Hz pre-emphasis is used in the recording process; this means that higher frequencies are recorded at higher relative amplitudes. The falling response above 2120Hz required in the *Fig. 11* characteristic is needed to compensate for the pre-emphasis. This type of response is employed because surface noise (which consists mainly of high frequencies) is attenuated by the falling response of *Fig. 11* above 2120Hz.

It can be seen that the bass frequencies are amplified more than any other frequency when one employs the type of response curve shown in *Fig. 11.* These frequencies can therefore be recorded at lower amplitudes for a given signal level than any other frequency. This helps to ensure that the cutting stylus does not foul an adjoining groove during recording, since in the low-frequency region the stylus must move farther than at higher frequencies for a given recording level.

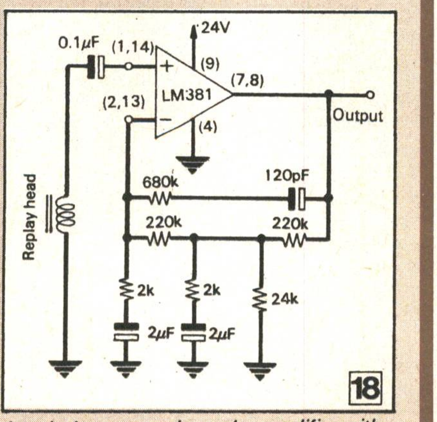
A circuit designed by Ferranti Ltd. for obtaining the RIAA response from their ZN424 low-noise operational amplifier is shown in *Fig. 12;* this circuit is suitable for use with a magnetic cartridge pickup. The two 100kOhm resistors in the pin 4 circuit provide the steady bias to this pin which keeps the output voltage at about half the supply voltage. The 0.1μF capacitor in the input lead prevents this bias from reaching the previous circuit.



A pre-amplifier circuit with an RIAA response together with tone controls.



A typical recording amplifier for feeding a tape recording head.



A typical tape recorder replay amplifier with NAB equalization.

The gain of the ZN424 without feedback is some 86dB (20,000 times) and the distortion about 1.5 per cent typical. The circuit shown provides the normally-required gain of about 34dB at 1kHz to couple a magnetic cartridge into a power amplifier. The amount of feedback required at this frequency is 86 − 34 = 52dB and this reduces the distortion to 0.004 per cent at 1kHz. The network in the feedback system provides the required frequency-response characteristic of *Fig. 11.* The 1kOhm resistor and 6.8μF capacitor between pin 2 and ground provide an effective rumble filter; more gain may be obtained by reducing the 1kOhm resistor value, but the 6.8μF capacitor value must then be increased in proportion to avoid loss of bass. The resistor-capacitor network between pins 5 and 14 is required for stability. The layout is not critical and this circuit provides a signal-to-noise ratio of some 70dB.

Another magnetic cartridge pre-amplifier providing the RIAA characteristic is shown in *Fig. 13;* this uses one of the two amplifiers of a National Semiconductor LM381 device. In this circuit the output is shown connected to a passive tone control circuit of the type discussed previosuly with the addition of balance control for stereo use.

The 47kOhm input resistor of this circuit provides the standard load for the magnetic cartridge. The resistor-capacitor network in the negative feedback circuit of the LM381 stage provides the required RIAA response as in the case of the *Fig. 12* circuit.

Unlike magnetic cartridges which have a response proportional to the stylus velocity, ceramic pickups respond to the amplitude of the stylus movement. They provide an output which is essentially independent of frequency in the constant amplitude regions at each end of the *Fig. 11* graph, but not in the centre constant velocity region. In practice ceramic pickups are used without equalization circuits, but the user must accept a loss in output of some 12dB as the frequency rises from 500Hz to 2000Hz. This is not a great disadvantage, since such pickups are used only in lo-fi equipment; they have the advantage that they can provide a relatively large output of the order of 1V rms and this enables them to be used to feed a power amplifier directly without any pre-amplifier in cheap equipment.

The equalization circuits used in magnetic tape replay amplifiers are based on the NAB (National Association of Broadcasters) standards, but complications arise because the frequency response of any system varies with the tape speed.

The signal fed to the recording head is a current which, at any one frequency is proportional to the signal voltage in the drive circuit. As the head is essentially an inductor, its impedance (and therefore the voltage across it) rises with signal frequency. When a tape is replayed, the signal voltage across the replay head rises with frequency as shown in *Fig. 14.* Initially the output amplitude is proportional to frequency, but at high frequencies the response falls off; the point at which it commences to fall off decreases as the tape speed is reduced. The fall off in the response

Tone controls and equalization

at high frequencies is due to a number of factors, including the small wavelength at such frequencies in the magnetic pattern on the tape and the relation between the wavelength recorded on the tape and head gap.

The graphs of *Fig. 15* shows the NAB equalization characteristics; the lower graph applies to the (1⅞ and 3¾ inches per second) speeds and the upper graph to the (7½ and 15 inches per second) speeds. *Fig. 16* shows the graph for the lower speeds together with the corresponding graph for the recording system. It may be noted that the two graphs in *Fig. 16* complement one another so that the overall gain at all frequencies is virtually constant. The recording response is a function not only of the recording circuit frequency characteristics, but also of the response of the recording head itself, which usually shows a peak in the region of 2kHz. The *overall* recording and replay response should be as in *Fig. 16*.

While it is difficult to achieve a standard response for any one tape speed, it is necessary to do so in order to allow a tape made on any recorder to be played back on any other recorder with satisfactory results.

A typical tape recording amplifier circuit is shown in *Fig. 17* but the exact design depends on the type of recording head used and on the signal input level. The circuit shown accepts an input of up to 10mV from the microphone and provides a 30μA driving current to the recording head. The mid-band gain is set by the series connected 150kOhm resistor and 20μF capacitor.

The components L1 and C6 are resonant at the bias frequency used and their purpose is to prevent the bias signal from passing from the recording head into the output of the *Fig. 17* circuit.

The circuit of *Fig. 18* shows a tape replay amplifier providing the NAB characteristic; it has been designed for use with a replay head which provides an output of 800μV at a frequency of 1kHz at a tape speed of (3¾ inches per second) and it provides an output of about 0.5V rms maximum. As in most active filter circuits, the required response is obtained by the use of a suitable resistor-capacitor network in the negative feedback loop between the output and the inverting (—) input of the LM381.

This article has covered the general principles of equalization and tone control circuits. Practical examples of tone control circuits, of loudness compensation, rumble and scratch filters and of equalization circuits for disc replay and for tape recording and replay have been discussed. In those circuits which require amplifiers, operational amplifier circuits have been shown, since the use of the these integrated circuit devices enables considerably simpler circuits to be designed than if separate discrete transistors are employed. Circuits using the same principles as those discussed can be constructed using discrete transistors.

If any of these circuits are constructed, suitable precautions must be observed in order to prevent the pickup of hum or noise. Unwanted pickup is most likely to occur at the inputs of operational amplifiers (especially if the input impedance is high), but it is generally wise to screen the whole of a pre-amplifier very thoroughly.

Simply Subjective

Caught speeding!

IS YOUR amplifier fast enough? Fast amplifiers are currently the rage, with many Japanese designs boasting bandwidths that would do a radio transmitter proud. Such vast bandwidths ensure that a fast-rising signal like a square wave is reproduced more faithfully than would a slower design (having a smaller bandwidth).

One manufacturer has even boasted that 'if most amplifiers are jets ours is a rocket'.

Curiously what I'm about to discuss has little or nothing to do with the bandwidth or risetime of an amplifier, though speed is certainly the subject. If you read the first piece in my *Simply Subjective* series you'll remember that I wrote about the speed of music as *perceived* when listening to records played on a turntable. This, as I pointed out, isn't necessarily related to the rotational speed of the platter and can be adversely affected by dynamic defects in the behaviour of feedback around direct-drive motors. Thus the music could sound slow despite the turntable going round at the right speed!

Given a little thought, and some listening tests to prove it for yourself, the foregoing is just about credible — certainly the idea of turntables sounding different is now more or less accepted. But how about amplifiers? Can they too affect the 'speed' of music as perceived by the listener. The answer is a resounding yes, an opinion reinforced by several recent experiences.

For instance, I have for a while been using the Meridian 101mc pre-amp with my old Quad II power amplifiers. The slightly forward nature of the Meridian offsets a slightly laid-back tendency in the Quads and also seems to improve dynamics over the original rather stodgy Quad 22 pre-amp. I had the opportunity of quickly auditioning the Electrocompaniet amplifier, a very highly regarded model from Norway based on a design by Matti Otala and manufactured in Scotland.

On swapping over to the Electrocompaniet from the Quad/Meridian set-up I marginally preferred the Electrocompaniet — some praise indeed! It had a lucidity and sweetness which was most attractive — but it was slightly slower! I had noticed before that the Meridian seems to make cymbals and snares seem 'faster' and this is probably linked with its tonal character. I hasten to add that the newer 75-ohm output module (as reviewed in the December '79 issue) is more tonally neutral.

Returning to the Electrocompaniet versus Meridian/Quad set-up I was pretty sure that the Norwegian design was the superior on grounds of tonality and detail but couldn't decide which was correct as regards 'speed'. The test was really too short but it did highlight a point which is often unnoticed, and if noticed probably ignored.

It also raised more questions in my mind. Could, for example, a slow-sounding power amplifier and an over fast sounding pre-amp effectively cancel out each other's effects or do two wrongs *not* make a right as in other aspects of hi-fi? Additionally could an over fast sound favour rock music while an over slow character favour orchestral reproduction? These are questions I cannot answer, but I suspect that there's only one correct 'speed' for all types of music unless personal preferences or bias affects judgement.

Along parallel lines I also noticed some curious things during a panel test on receivers carried out by Philip Mount (March 1980 issue). On the morning of the tests I rushed out of the house and, determined to include some classical orchestral material, I grabbed an Enigma disc which I hadn't really listened to — assuming that the quality must be up to a certain standard. James Laughran and the Halle implied insurance against a poor performance.

As it turned out my complete lack of aquaintance with the record proved to be illuminating. With the first few amplifiers the performance of the musicians seemed poor and the record did not seem to be well recorded! I felt embarrassed to have brought along such a poor example of a classical disc, seemingly musically inept. I mean, Beethoven with no drive or power!

I had brought the record hoping that the positive vision behind the music would test the receivers and it seemed the record was a duffer. I had all but given up when to my pleasant astonishment the music suddenly became powerful and visionary, somehow the musicians had switched from automatic pilot and woken up. The cause was a change of receiver to the Harman Kardon HK450. Refreshingly this sudden improvement in the Beethoven was exactly duplicated in an improved authority and more accomplished performance by the musicians playing the rock music. So whatever was happening electronically under dynamic conditions within the receiver, was benefiting both types of music. Hardly surprising really!

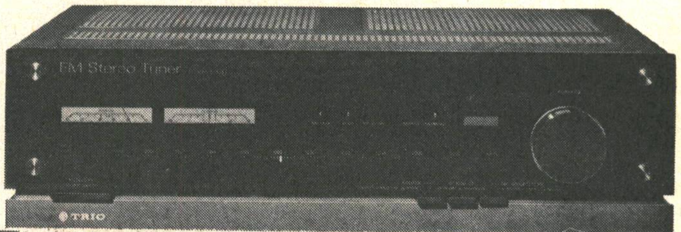
So the Halle *weren't* performing like amateurs: it only *seemed* as though they were through some of the receivers. The perceived pace and drive of the music were adversely affected by most of them and this, of course, neatly brings me back to my opening question. Is your amplifier fast enough? It could even be *too* fast!

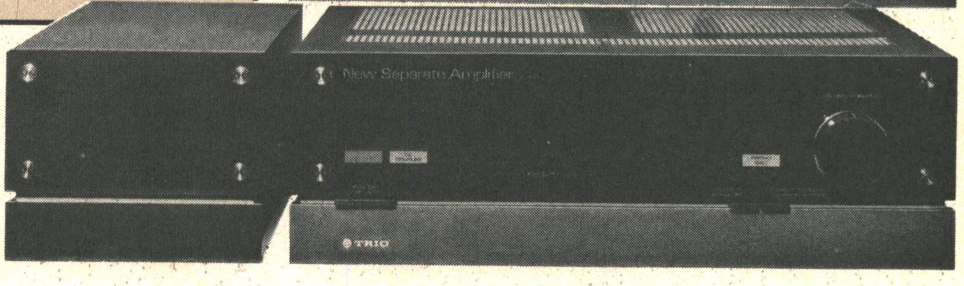
The only answer is in listening, but unless you have a good amplifier or receiver for comparison you may never know what you're missing. Sometimes, on the other hand, blissful ignorance, though inexcusable, is more comfortable (and less expensive).

Dave Berriman

Trio's L-07D turntable features a stainless steel record mat!

Trio L-01T non-magnetic tuner and L-01A non-magnetic amplifier and power supply.





TRIO's LATEST TECHNOLOGY REVEALED

WE were recently invited to Trio's (known as Kenwood outside the UK) European headquarters in Brussels. Purpose of the visit was to show us the latest fruits of their technological labours, namely their non-magnetic L-01A amplifier and L-01T tuner, their L-07D turntable, L-Z1 PCM (digital) processor and L-X5 photo-electric cartridge with matching L-X6 pre-amplifier. However before you rush forward cheque books at the ready, these latter three items were prototypes and won't be available for two or three years yet.

Trio's engineering team gave us the most detailed coverage of their discovery of 'magnetic distortion' and its elimination. This same information, incidentally, formed a paper read at the AES (Audio Engineering Society) convention held in London this February. The papers and briefings we were given were necessarily technical, but in a nutshell the effect Trio have focussed onto is as follows. It's well known that magnetic materials (many steels, iron, and certain alloys which are attracted by magnets), behave in a non-linear fashion. This means that the strength of magnetism in the material is not directly related to the magnetic *force* applied. This force for our purposes is electric current.

We all know that electric currents flowing in coils produce magnetism — that's how electric motors, electro-magnets, and dynamic loudspeakers work. In addition, changes in magnetism induce a current back into the coil. This gives rise to the effect known as inductance. What's not often realised is that around *any* wire carrying a current of electricity there exists a magnetic field. This is strongest for large currents.

Now comes the subjective part: it seems that manias (in Japan, real hi-fi nuts are known as 'manias') had been noticing that if they built their own amplifiers with a wooden case instead of a steel case the sound was superior!

Of course, we all know this is ridiculous: "*I know it can't happen therefore it doesn't happen*" is a common reaction to this sort of thing (especially with certain conservative British manufactureres). The Trio engineering team, being an open-minded bunch (with a management having an eye on potential sales to manias no doubt) set to work. They found from measurements that simply placing wiring which carrys high currents (such as speaker and power supply cables) close to magnetic materials produces odd-order distortion. This is particularly true over 1kHz and over about five watts output. This is due to non-linearity and hysteresis in the magnetic materials inducing distortion back into the wire. These effects were apparent when the wiring was within 50mm of the magnetic material and, of course, increased for close distances, there being roughly a 30dB reduction in distortion levels by moving the conductor from zero mm to infinity at 2.5 amps. (50 watts into eight ohms). Not content with just measurements, they worked out a mathematical model of the cable and magnetic material and analysed the effects by using a powerful computer! The results confirmed their measurements. 'Magnetic distortion' exists.

Predictably the distortion products generated by 'magnetic distortion', as Trio dub it, are odd order (in other words, third, fifth, seventh, ninth harmonics and so on: these are known to be much more audible than even harmonics. Now, though distortion products produced by magnetic distortion *within* the amplifier's feedback loop will be reduced by feedback, the wiring *outside* the loop, namely the output leads, are particularly susceptible because distortion introduced here cannot be reduced by the feedback. To eliminate 'magnetic distortion' Trio have made the cabinets of their L-01A amplifier and L-0T tuner (see March news) of nylon, aluminium and brass where appropriate. The mains transformer has also been moved to a separate box to keep this large bulk of magnetic material away from the circuitry. The rectifiers (and hence the dc wiring to the power amplifier) have been placed within the amplifier — not close to the transformer. The power supply itself in fact consists of two supplies, one for each channel with lots in reserve for musical climaxes. Elimination of magnetic materials has almost been taken to lunatic ends in some cases such as the non-magnetic switch cases and copper-foil capacitors!

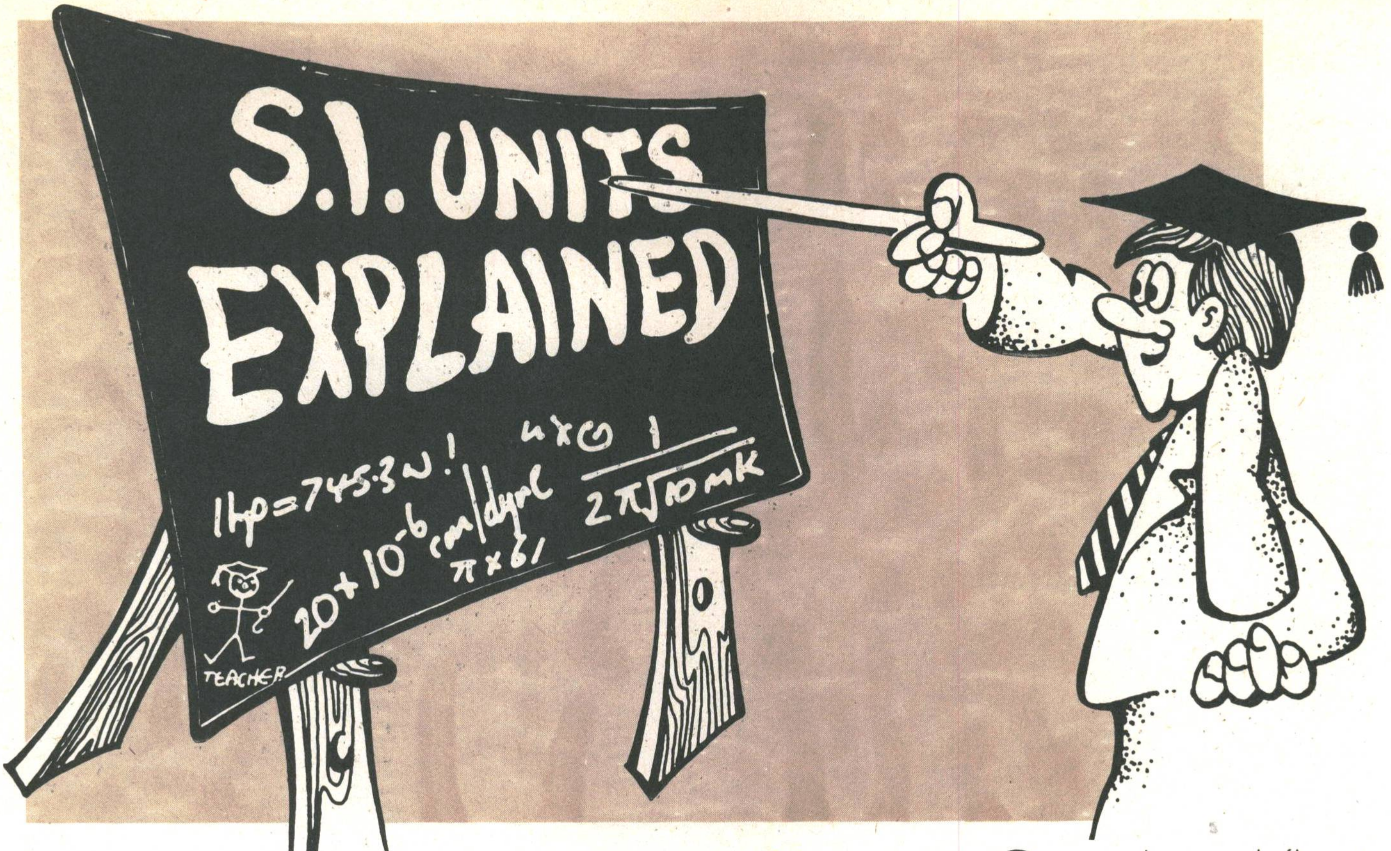
Listening is, of course, the ultimate test, and we had an opportunity to hear the L-01A reproducing digital recordings from their L-Z1 digital processor. Certainly the sound had a stunning dynamic power to it, partly due to the digital recording but also, obviously, due to the amplifier. The digital programme had the familiar digital vague glassiness and almost a 'clipping' effect on a vibraphone recording played — analogue mic amp overload or the digital system caught out?

Multi-layer deck

Anyway, I've over written again and haven't enough space to do justice to their L-07D turntable, but believe me the designer has gone all out for rigidity around the cartridge/arm/platter, record loop. The turntable uses multi-layer techniques (which push resonances high up out of harms way rather than relying in lossy information-robbing damping materials in 'series' with the mechanical circuit. The record mat, for instance, is stainless steel, on an aluminium platter with a dural disc underneath. There's no rubber mat — the record goes straight onto the steel! How's that for tight coupling?

The sound? Using the Denon 103 (or their photo-electric prototype L-X5 which was good) it wasn't as impressive as the digital — which was undoubtedly superior to this or any disc system your likely to encounter in terms of bass solidity, detail and dynamics — but that edgy effect wasn't present. Funny I often hear this when I hear digital — must be my ears or could it be . . . ? *DB*

S.I. UNITS EXPLAINED



by Gordon King

SI UNITS stands for *SI-Le Systeme International d'Unites* (International System of Units) — a system which seeks to rationalise engineering units throughout the world. SI units are superseding the units of prevailing metric systems and systems based on Imperial Units, and since SI units are now beginning to percolate into the technical parameters of hi-fi equipment, particularly those items based on electromechanics, we felt that the time is now ripe to bring the units out into the open and see how they compare with the units of earlier designation.

It may be thought that the move to SI units is somehow linked to the general move towards metrication; this is not the case, however, since engineering units have been based on metric units for very many years. One unit system was based on centimetres, grams and seconds (cgs system), and another on metres, kilograms and seconds (mks system). Neither of these systems, though, yielded a fully coherent set of units for all scientific and engineering disciplines; the SI was developed to resolve this aberration.

Base units

The three primary base units of SI are the metre (m) for length, the kilogram (kg) for mass and the second (s) for time. As these relate to the base units of the earlier mks system (people vaguely familiar with this system generally experience little difficulty in appreciating the units of SI). Conversion problems can be greater between the cgs system and SI.

However, to be completely coherent, other base units need to be drawn in. The SI has seven such units: the three just given, electric current (I) measured in the ampere (A), thermodynamic temperature (T) measured in kelvin (K), luminance intensity (I) measured in candela (cd), and the amount of substance (Q) measured in the mole (mol). There are also two supplementary angular units.

Derived units

From these hosts of other units are derived, and those which could be important to us include: force measured in the newton (N) (kg m/s^2), pressure measured in the pascal (Pa) (N/m^2), power measured in the watt (W) (J/s), energy measured in the joule (J) (N m, W s), electric charge *and* electric flux measured in the coulomb (C) (A s), magnetic flux measured in the weber (Wb) (V s), magnetic flux density measured in the tesla (T) (Wb/m^2), electric potential measured in the volt (V) (J/C, W/A), resistance measured in the ohm (Ω) (V/A), conductance measured in siemens (S) (A/V), capacitance measured in the farad (F) (A s/V, C/V), inductance measured in the henry (H) (V s/A, Wb/A) and frequency measured in the hertz (Hz) (1/s).

Definitions

In the scope of an article of this kind it is not feasible to define all the units, but the definitions of some of the more important ones will be useful.

Coulomb Quantity of electricity moved in 1s by a current of 1A.

Farad Capacitance obtaining when 1V potential-difference (pd) exists between the plates of a capacitor which is charged to a value of 1 coulomb.

Henry Inductance produced when 1V electromotive force (emf) obtains from a uniform current variation of 1A/s.

Joule Work resulting from 1m displacement by the application of a force of 1N in the direction of the displacement.

Kelvin Refers to absolute zero where bodies exhibit thermal energy. Referred to the Celsius (Centigrade) scale, 273.15K corresponds to 0 deg.C and 373.15K to 100 deg.C.

Newton Force which produces an acceleration of 1m/s^2 to a mass of 1kg.

Ohm Resistance of a conductor when the pd across it is 1V and the current flowing through it 1A.

Volt PD across a conductor when carrying 1A and when the power dissipated by the conductor is 1W.

Weber Magnetic flux which yields an emf of 1V in a circuit of one turn when the flux is diminished to zero at a uniform rate in 1s.

The primary electrical units are defined essentially in the ways previously established; the main impact of SI in our line of country concerning more the mechanical aspects, including sound pressure level.

Compliance

The compliance of a pickup cartridge or loudspeaker suspension, for example, has previously (and, indeed, often still is) expressed in terms of cm/dyne, where the dyne is the old unit of force corresponding to the force produced by the pull of gravity on 1/980 (approximated to 10^{-3}) gram at latitude 45 degrees and sea level! The SI definition adopts the metre instead of the centimetre and the newton instead of the dyne, giving m/N.

A typical pickup cartridge compliance value is 20x10^{-6}cm/dyne, which implies that the stylus would deflect on its hinge 20-millionths of a centimetre (which is 200 micrometers) when one dyne of force is applied, or 0.2 millimetre when 1,000 dynes of force is applied. Compliance, it will be recalled, is the 'reciprocal' of stiffness — less the stiffness, the higher the compliance.

To translate this to SI terms we have to apply the newton (equivalent to 10^5 dynes) and the metre (equivalent to 10^{-2} centimetres), which yield 20×10^{-3} m/N. This implies, assuming a sufficiently wide range of deflection, that the stylus would deflect 20 millimetres when subjected to a force of 1N, or 0.2 millimetre when subjected to a force of 0.01 (10^{-2}) N. Since the newton is equivalent to 10^5 dynes, 1,000 dynes is equivalent to 10^{-2} N, which neatly proves the correspondence of the two expressions.

Not all engineers are happy with large units like the metre and newton, particularly when dealing with the small deflections and small forces associated with pickup cartridges and other electromechanical devices of hi-fi and audio, and thus prefer to continue using centimetres, dynes and, perhaps, milligrams. This is one reason why the SI expressions have not generally filtered into pickup specifications.

Tracking force

Tracking force is commonly (though incorrectly) expressed as tracking weight in grams. While a mass of, say, 1kg would weigh 1kg here on Earth, in space or at the centre of the Earth it would have zero weight, while at the top of a mountain it would weigh less than 1kg, yet its mass would still be 1kg. The force, of course, stems solely from the attraction of gravity on the mass.

Because in the environment already defined, the attraction of gravity on a mass of 1 gram corresponds to a force very close to 980 dynes, a 3-gram tracking force is more correctly 2,940 dynes in old units and 2.94×10^{-2} newton (29.4 millinewtons) in SI units. Of course, it is much easier to say and write 3g than 2.94×10^{-2}N, and since we all clearly understand what 3g means, it is unlikely that we shall find our pickup arms of the future calibrated directly in N, though, I suppose, it is possible that the millinewton (mN) will eventually be adopted! As a fair approximation, all there is to remember in this conversion is to multiply the gram value by ten and call the result mN, so that 2g would become 20mN, 1.5g 15mN, etc. However, the use of decimal prefixes can introduce non-coherency.

Resonance

Mechanical resonance results from mass and compliance, the expression being:

$$f = \frac{1}{2\pi\sqrt{mk}}$$

Let us suppose that a pickup arm (including the mass of the cartridge) has an effective mass of 15g (15×10^{-3}kg), and the cartridge a compliance of 20×10^{-6}cm/dyne (20×10^{-3}m/N). If we do this little sum with the early units we get:

$$\frac{1}{\sqrt{6.28 \quad 15 \times 20 \times 10^{-6}}}$$

which works out to 9.19Hz (f_0).

If we do it with SI units we get:

$$\frac{1}{6.28\sqrt{15 \times 10^{-3} \times 20 \times 10^{-3}}}$$

which, of course, also works out to 9.19Hz (f_0). Although patently obvious, the exercise does, at least, show how the conversions work in a standard formula.

Velocity and acceleration

Using the early units, velocity is cm/s, and with SI units m/s. Thus, while a recorded velocity may be expressed as, say, 10cm/s; with SI it is 10×10^{-2}m/s.

Using the early units, linear acceleration is cm/s^2, and with SI units m/s^2. For example, acceleration due to gravity is 980.665cm/s^2 in early units and 9.80665 m/s^2 in SI.

Magnetic flux

The former expression for magnetic tape flux was millimaxwells per millimetre (mM/mm). Using SI it becomes nanowebers per metre (nWb/m), where nano is 10^{-9}. For conversion, 1Wb equals 10^8M, corresponding to 10^8 lines, so that 1mM/mm equals 10nWb/m.

Pressure

Nominal atmospheric pressure expressed in old units is 10^6 dynes/cm^2. Translating to SI it becomes 10^5 pascals (Pa), which is equivalent to 10^5N/m^2 (Pa is derived from N/m^2, which is the force in newtons resulting from the pressure acting on a surface area of 1 square metre). 10^5Pa is also equivalent to 1 bar (or 1,000 millibars), which corresponds approximately to the scale centre of a household barometer.

Sound pressure level at the threshold of hearing corresponds to a variation within the nominal atmospheric pressure of 0.0002 dyne/cm^2 in old units, and to 0.0002 N/m^2 (equal to 20μPa) in SI. This is referred to as 0dB. At the threshold of pain (say, 120dB), the pressure variation within the nominal atmospheric pressure is 200dynes/cm^2, early units, and 20Pa SI.

Sound power

At 20μPa sound pressure level, the power is 10^{-16}W/cm^2 in old units, and 10^{12}W/m^2 is SI. This is at the threshold of hearing, or 0dB. At 120dB (pain threshold), the power is up to 10^{-4}W/cm^2 (100μW/cm^2) in old units, and 1W/m^2 in SI. This means that 1W is radiated into every square metre when the sound pressure level is 20Pa.

It is difficult to imagine the intensity above, say, 130dB. This sort of pressure can quickly impair the hearing and damage the ear. For example, at 140dB no less than 100W is radiated into every square metre; at 170dB 100,000W is radiated into every square metre — one would perish before this sort of intensity was reached.

Decibels

Both sound power and sound pressure can be expressed in terms of decibel (dB) ratios. In general, the dB is the logarithm of two powers — ten times the common logarithm of the power ratio, in fact, which merely converts the basic Bel to the *deci*bel. Hence:

$$\text{dB} = 10 \log_{10} (W/W_0)$$

where (W/W_0) is the ratio of the two powers involved. Because a dB value is a ratio, the reference power W_0 must be stated or clearly understood (we have just seen that with sound *power* this corresponds to 10^{-12}W/m^2, which is the 0dB reference).

Because sound *power* is proportional to sound *pressure squared*, the dB ratio resulting from the two pressures is given by:

$$\text{dB} = 10 \log_{10} (p/p_0)^2$$
$$= 20 \log_{10} (p/p_0)$$

where (p/p_0) is the ratio of the two pressures involved. The 0dB reference in this case is 20μPA, as we have already seen.

Further derived SI units

To supplement the derived units given earlier, the following are some further derivations which could be useful.

Current density	A/m^2
Dynamic viscosity	Pa s
Energy density	J/m^3
Electric field strength	V/m
Electric flux density	C/m^2
Heat capacity	J/K
Magnetic field strength	A/m
Permeability	H/m
Permittivity	F/m
Power density	W/m^2
Resistivity	Ω/m
Specific heat capacity	J/(kg K)
Surface tension	N/m
Thermal conductivity	W/(m K)
Torque	N m

Conversion factors

Some of the more important conversion factors could also be handy:
1in = 0.0254m; *1ft* = 0.3048m; *1yd* = 0.9144m; *1 mile* = 1,6093km; *1in*^{2} = 6.4516 x 10^{-4}m^2; *1ft*^{2} = 0.0929m^2; *1yd*^{2} = 0.8361m^2; *1 mile*^{2} = 2.5898km^2; *1in*^{3} = 1,6387 x 10^{-5}m^3; *1ft*^{3} = 0.0283m^3; *1yd*^{3} = 0.7645m^3; *1gal* = 0.0045m^3; *1lb* = 0.453 6kg; *1cwt* = 50.803kg; *1ton* = 1016.06kg; *1ft/s* = 0.3048m/s; *1ft/min* = 5.08mm/s; *1mile/h* = 0.4470 M/s; *1 knot* = 0.515m/s; *1kgf* = 9.806 6N; *1lbf* = 4.4448 2N; *1m kgf* = 9.806 6J; 1ft lbf = 1.355J; *1Wh* = 3 600J; *1hp* = 745.7W.

Finally, it will be interesting to look at the specification of a gramaphone pickup cartridge in SI units (with the earlier units — still often employed — in parentheses).

Cartridge specification:

Parameter	**Value**
Stylus tip	**1.78×10^{-5}m (0.0007in.)**
Effective tip mass	**0.9×10^{-6}kg (0.9g)**
Frequency response	**20-20,000 Hz (20Hz-20kHz)**
Output at 5×10^{-2}m/s	**6×10^{-3}V**
Output at 5cm/sec.	**6mV**
Tracking force range	**20-40 mN (2-4 g)**
Optimum tracking force	**30mN (3g)**
Compliance	**15×10^{-3}m/N (15×10^{-6}cm/dyne)**
Separation 1kHz	**25dB (25dB)**
Mounting centres	**1.27×10^{-2}m (0.5in.)**
Weight	**6×10^{-3}kg (6g)**

True, we have taken some of these conversions too far(!); but they do serve to illustrate what is involved in SI translation. In general sub-multiples of the SI expressions would generally be adopted, as in expressing tracking forces as 30mN rather than as 3×10^{-2}N, and compliance as 20μm/mN rather than 20×10^{-3}m/N.

SAVE £££s ON THIS OFFER

exclusive to PRACTICAL HI-FI readers

PRACTICAL HI-FI SOUND

The Book and the Record

At a saving of nearly £2.50 on typical retail prices, this combined package is obtainable only from PRACTICAL HI-FI We are pleased to be able to offer you this remarkable book and this unique reference record for just £7.50 (plus £1.00 postage and packing) / *mailed direct to you*

The Book

WRITTEN by leading audio expert, Roger Driscoll, is designed to help you to better understand hi-fi equipment and therefore get greater musical satisfaction from it. The book goes right back to basics and in easy-to-understand terms shows how hi-fi aims to re-create the 'live' experience. Latest developments in digital sound reproduction, loudspeakers, and so forth are put in perspective.

There's plenty of advice on choosing equipment, and recommendations are made in various price categories.

And the chapter on room acoustics and how to analyse them when setting up a system will be vital to any hi-fi enthusiast. You could be surprised at the improvement you'll get by properly siting your speakers.

Finally, included in the book, is a new compact loudspeaker design by Roger Driscoll. Details of how *you* can make it, and where to obtain kits, are only in **PRACTICAL HI-FI SOUND.** At our special price, it's worth it just for that alone!

The author

ROGER DRISCOLL, MSc, PhD is widely known in the world of hi-fi as a lecturer and consultant. Many readers will probably have heard him talking and answering questions at top shows around the country and, of course, he's one of the leading figures in the British section of the Audio Engineering Society.

Roger has written for all the major hi-fi journals, and is probably best known as a reviewer of loudspeakers, but it may surprise you to know that he also undertakes such projects as the sound system for the Fairfield Hall in Croydon, Surrey. It's this unique experience on both the domestic hi-fi and the professional 'live' music scenes that makes Roger the ideal author of a book which aims to take away the myth and mystique of hi-fi and concentrate on what matters £ the music.

The Record

OF course, in trying to express what hi-fi's all about, the printed word is always at a disadvantage. Until now, that is because, to accompany Roger Driscoll's book **PRACTICAL HI-FI SOUND** we've put together a unique music reference record which you can buy in conjunction with the book at our special combined price.

There are no test tones, no pink noise, no silent grooves on this disc, yet it will tell you as much about the performance of your hi-fi system as any of the usual 'test' discs. Yet it can also be enjoyed as a well-produced album in its own right, because it consists entirely of *music.*

But not just any music. Each track has been chosen to illustrate specific points about reproduced sound, and what you should hear (or not hear) is fully detailed on an accompanying inset sheet of technical information. Why music? Well, your hi-fi system is primarily concerned with extracting the maximum amount of information from the record groove isn't it?

The record illustrates many of the points made in Roger Driscoll's book and is, therefore, an invaluable asset.

The music

REGULAR readers will know how highly we rate the production and pressing quality of Philips records, and, indeed, the achievements of their artists as well. So, when we were looking for the best on record, it was natural to go to them. After exhaustive listening to both discs and master tapes, we finally came up with a selection from their rock, middle-of-the-road, and classical catalogues which we consider will bring out the best from any hi-fi system.

But good music demands good production, and, not only is the sound quality of these selections to the highest standards currently obtainable, so is the disc production, with the best in cutting, plating and pressing.

As you can see, with *this* reference record, you can forget the hi-fi and just listen to the music if you wish!

PRACTICAL HI-FI SOUND

Book/Record offer

Please send me ☐ **set(s) of the PRACTICAL HI-FI SOUND book and reference record package at £7.50 each (plus £1.00 P&P per set)**

I enclose a cheque/postal order* for £ ☐☐

Please ensure all cheques and postal orders are crossed and made payable to *IPC Magazines Ltd., ('Practical Hi-Fi Sound' Offer).*

PRACTICAL HI-FI Send to:
'PRACTICAL HI-FI', IPC MAGAZINES LTD.,
KINGS REACH TOWER, STAMFORD STREET, LONDON SE1 9LS.

NAME ....

ADDRESS ....

....

.... POSTCODE ....

*DELETE WHICHEVER IS INAPPLICABLE

Please allow three weeks for delivery.
Offer open only to readers in the United Kingdom, Northern Ireland and Eire.
We are not responsible for delays, damage or loss in the post.
Proof of posting not accepted as proof of receipt.

How to order your book and record —

It couldn't be simpler. Just fill in the coupon and send it with your cheque or postal order to the address shown on the coupon. We will process your order as quickly as possible, but please allow three weeks for delivery.

Remember, this offer is limited so get your order off TODAY!

PRACTICAL HI-FI SOUND

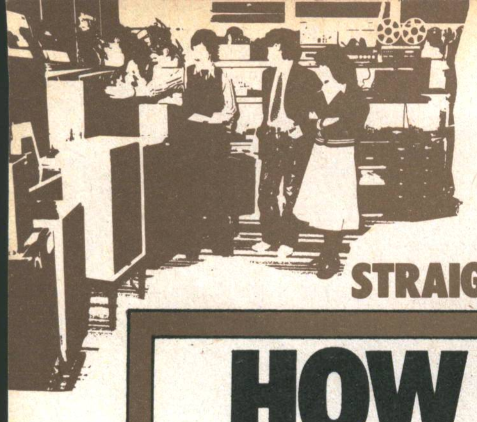
GETTING YOUR COPY IS SIMPLY SOUND SENSE!

Revox Tape Recorders–
Ask Anyone.

We enjoyed considerable world-wide success for over ten years with our A77 series,
and now we're enjoying the same success with our B77.
Over 60 sensible options on the basic model has made the B77 so versatile that they can
be found in recording and broadcasting studios, in use with musicians,
and of course in domestic Hi-Fi systems.
Anyone will tell you why the Revox B77 has gained the reputation it has – and why it is the
tape recorder which sets the standards by which others are judged.
Write for a copy of our new colour catalgoue.

STUDER REVOX

F. W. O. Bauch Limited, 49 Theobald Street, Boreham Wood, Hertfordshire. Telephone: 01-953 0091



STRAIGHT TALKING ABOUT LOUDSPEAKERS

HOW THEY CAN MAKE YOU BUY ANY LOUDSPEAKERS THEY WANT YOU TO

ROBERT ANGUS MEETS HERBY WHO EXPOSES THE SHADIER SIDE OF HIS HI-FI BUSINESS IN THE STATES

I DON'T know what caused me to walk into the shop — perhaps it was the window display or the fact that I had some time to kill. In any case, I walked in and got the surprise of my life. For there, standing in the room, was my high school buddy, Herby.

I should explain that when Herby and I went to school together in Toronto's Cabbage town, I headed the school newspaper and Herby headed the Protective Association — the one which insured younger kids from getting beaten up and their lunch money stolen by Herby and his associates in exchange for a weekly premium. By the time he left school, he was into "low sharking" in a small way, and the last I'd heard, he'd moved to Philadelphia to seek fame and fortune as the operator of that city's first porno film theatre.

Now here we both were in the hi-fi business — Herby selling it and me writing about it! It seems that following his career in porn he developed an interest in selling — aluminium, encyclopedias, retirement land in some of the highest peaks of the Rockies, pyramid schemes that included everything from grand pianos to tape recorders and stereo systems. And now here he was on the floor of his very own audio showroom!

"It happened when I got involved in that tape recorder pyramid scheme," Herby explained *"I discovered I had a love affair with audio. You know how a pyramid scheme works."* I nodded, and he explained anyway. *"You start off with a very expensive item. It doesn't matter much what it is — a vacuum cleaner, aluminium siding, a stereo set — and a list of sales prospects. It helps if the prospects don't have much money and aren't very sophisticated. Well, you come in with this 500 dollar item, whatever it is, knowing full well that they haven't got 500 dollars. Then you tell them they can have the item for nothing — or for very small monthly payments. What you're really selling is a finance contract. But if this person or "the mark" will give you the name of a friend who might be interested in the item, and will tell the friend you're coming, and the friend buys, you'll credit him with 25 dollars against the purchase price. Why, if you only make two sales a month out of the list of names he supplies you, he can cover his payments and the whatever-it-is may end up costing him nothing at all. Of course, none of this is in the contract he signs. That's with the finance company, and they want their money no matter what."*

"But what has that to do with hi-fi", I asked innocently. *"For sheer saleability, there's nothing like hi-fi — in particular hi-fi loudspeakers. Take these two boxes,"* he told me, steering me to a pair in the listening room. *"By looking at them, you have no idea what's inside, have you?"* I shook my head. *"Yet this one costs approximately twice as much as that, and if I play them for you, you may not be able to tell the difference. Speakers are what I call a blind item — the shopper has no way of telling by looking whether it's any good or not, what's inside, or whether it's worth the money. And by a little creative selling, I can sell you whatever loudspeaker I want to."*

This certainly was the Herby I remembered, but still I seemed a trifle incredulous. *"You don't believe it?"* he asked. *"Well, take this listening room, for example. I have 24 speakers in here — 12 different pairs — hooked up so that I can switch from one to the other."*

"So they can compare one with another and pick the one which sounds right to them before buying, right?" I asked.

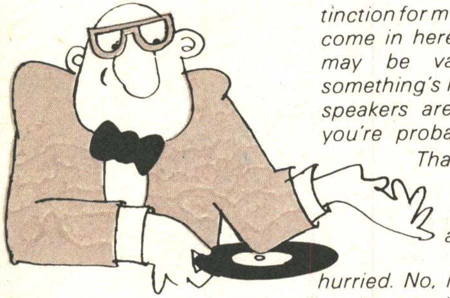
Herbie gave me a look withering in its contempt and full of pity for my naivety. *"You gotta be kidding. This is a business and I'm in it to make a profit. You think I'm gonna let some dumb consumer come in here and walk out with what he wants? He's going to buy what I want to sell him, and he's going to like it.*

"For instance, every speaker performs best in a certain position relative to the listener. Some sound best in a corner, where the side wall and floor can enhance the bass. Others with more bass sound better away from side walls, while still others sound best on shelves at ear level. Some sound better on their sides than standing on end, and the Bose really sounds dull if you push it against a rear wall.

"Then there's the matter of stereo imaging. You can ruin the impression a pair of speakers makes by putting them too close together so that there isn't enough stereo spread or too far apart so that there's a hole in the middle. And, of course, you can deliberately wire speakers out of phase so that they don't sound their best."

"Why?" I asked. *"Because you can't sell them that way?"*

"Because it's too subtle a distinction for most of the people who come in here. Even at home you may be vaguely aware that something's not quite right if your speakers are out of phase, but you're probably not sure what. That's because you're listening for prolonged periods and the environment is quiet and unhurried. No, in a store you've got to be more obvious than that. Let me give you an example."



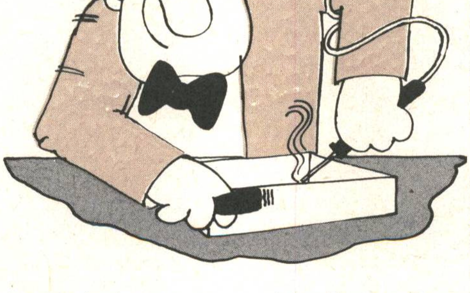
Herby wiped a sleeve across a gritty demonstration record and placed it on the turntable. Within seconds, Charlie Byrd streamed down from a name-brand speaker on a shelf near the ceiling. The sound was okay, but the bass was only fair to middling and the treble seemed a trifle thin. Then he switched to a pair of speakers on the floor. There was undeniably more bass, the treble sounded sharper and the overall sound seemed more like live music.

"See what I mean?" he inquired.

"What's the difference?" I asked.

"Well, that one on the top shelf is an AR17. It's heavily advertised and a lot of people come in here asking for it. But it is pretty costly, and I only make 25 per cent if I sell one. Now I have the speaker on the bottom shelf made for me right here in Toronto. It costs the consumer 10 dollars less, and I make 60 per cent profit every time I sell one. I've got to be crazy to sell the AR, don't I?"

"But if the AR is the speaker everybody wants to hear, why isn't it more accessible?" I asked. *"Have you ever wondered why the speaker the salesman wants to sell you is located in exactly the right spot to sound great and the speaker you came in to buy is in exactly the wrong spot? It's no accident, I can tell you."* Herbie continued, *"I give it a lot of thought before I decide where to put a new speaker. I may try out two or three locations before I finally decide."*



Herby explained that in this demonstration, he had one other factor working for him. *"You probably didn't notice, but my speaker sounded slightly louder than the name brand. That's because if other things are roughly equal, shoppers almost always choose the loudest of two speakers. Actually, mine is somewhat more efficient than the AR, which means that with the same amount of power from the amplifier, it sounds louder. If you're going to listen to speakers before buying, you should make sure that all of them are playing at the same volume. Most stores go to a great deal of trouble to make sure that when they switch back and forth between speakers this is the case. But that's foolish, because then the customer can use his own judgement, and who knows what he's likely to do?"*

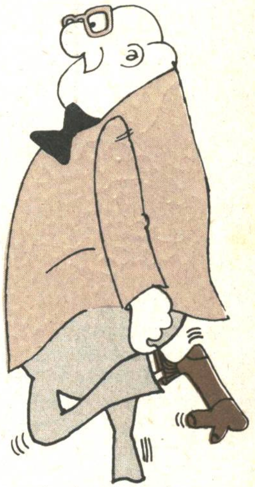
Herby went on to explain how he puts speaker efficiency to work for him. *"I have this folded Klipschorn — so efficient it will work from a transistor radio. Nobody every comes in asking for it. Instead they want to hear one of the highly-touted bookshelf or electrostatic models if they're in that price range. So before demonstrating the speakers they want to hear, I play the folded horn. Invariably, an acoustic suspension or electrostatic sounds dull with the sound of the horn still ringing in their ears, simply because it's louder. I don't have too much trouble selling them despite their high price.*

With all of that, Herby laments customers still sometimes insist on walking out with the speakers they intended to buy when they walked in. *"So I do a little creative surgery. They can't tell the difference, and it helps me to sell the speakers I want to sell."*

What's creative surgery? Well, in the case of one heavily-advertised acoustic suspension on Herby's shelf, it consists of drilling four small holes in the back of the cabinet. *"You'd be surprised how much difference they make in the sound — the bass loses its punch — and even if the customer looks back there, he isn't likely to see them. Here's another one."* Herby pointed to a BIC Venturi and flipped a switch on his comparator panel. The sound was adequate, but instead of the crispness one normally associates with a Venturi the sound I heard seemed muffled.

"What did you do to it?" I demanded.

"Stuffed a sock in it," he admitted. I thought he was kidding, so I snapped off the grille. There, stuffed into the speaker's slot was a wool sock. I shook my head and snapped the grille back in place.



"If all else fails, there's the contour control ploy." Herby concluded. *"I take a certain amount of pride in it because I invented it myself. It consists of taking any receiver and fixing the contour control so that it functions the same way whether the switch is in or out. Then you tune the receiver so that the speaker you're pushing sounds its best with the contour you've selected, and whatever you're demonstrating against sounds bad. Now, whatever you do with the receiver, the customer is going to agree that the speakers you're trying to sell sound best."*

I've heard of adjusting amplifier tone controls to optimise the sound of a particular speaker, and I know that many dealers adjust the control knobs on the rear of the speakers themselves to produce optimum results. But this was the first time I'd heard of loading the dice as Herby had done. Why?

"Because the more sophisticated customers these days know all about the tone and contour controls on the speakers and the amps. They want to hear things flat, so I let them think they're hearing things flat. All it takes is a little solder inside the set."

It had been a long and quiet afternoon, with no other customers in the shop. But now one came in, clutching an advertisement. Herby excused himself and went to wait on him.

"Hi there," the shopper began. *"I saw your ad for the KLH Baron and I'd like to buy a pair. But can you really sell them for a price as low as this?"*

"That's our price, Sir, the lowest in town. But before you buy, maybe you'd like to hear them along with another speaker that may be an even better buy . . ."

I waved goodbye and strolled out into the afternoon traffic. I really didn't want to hear any more.

WHY DO SPEAKERS HAVE TO BE SO BIG TO SOUND

A TREE falls in a forest, thousands of miles from the nearest human being. Is there sound?

Chances are you ran across that one in your basic college physics course. The answer, according to the professor, is no — because, although the crashing tree sets up sound waves in the air, there is no hearing mechanism to perceive and catalogue them. Sound, if you will, involves a process of transmitting and receiving. Without both, the process is incomplete. While the physics of loudspeakers concerns primarily the transmission of sounds waves, it's necessary to understand the complete process to see how and why loudspeakers work as they do.

Let's go back to that falling tree. As it topples, it pushes air before it, creating a partial vacuum behind. As the branches crash into the other trees on the way down, they bend and snap, causing subsidiary pile-ups and vacuums in the surrounding air. Finally, as the entire mass collides with the earth, there's a series of vibrations, both in the earth itself and in the tree trunk. These vibrations, too, set up movements in the air.

Human computer

Now we introduce into this environment a woodsman who, with his trusty axe, is responsible for the downfall of the mighty spruce. Like ripples in a pond, the mounds and vacuums in the air move out from the vibrating surface until they reach the woodsman's ears. The outer ear acts as a funnel, chanelling these changes in air pressure through the earhole and the tunnel inside which terminates at the eardrum, a thin membrane which moves in and out in accordance with those rapid changes in air pressure. Inside, a multitude of tiny hairs suspended in liquid begin to move. This movement is translated into impulses which move rapidly through the nervous system to the brain. Behaving like a computer, it compares this new stimulus with a memory bank of thousands of stimuli. In a split second, the brain not only identifies the sound of the falling tee, but tells the woodsman what direction it comes from and how far away it is. It performs this chore by comparing the stimuli received from each ear and using the slight difference in intensity plus the slight difference in the times at which the sound waves reach each ear, to compute direction and distance.

Now let's suppose our woodsman has a buddy, working in another part of the forest. He wants to shout a warning just before the big tree falls. So instead of bellowing at the top of his lungs, he turns in the direction where his co-worker is, cups his hands around his mouth, then shouts.

Why? Because he knows from experience that by using his hands he can reinforce the sound of his voice—ie: the sound waves sent up his throat by the vibration of his vocal chords — so that it travels farther in the direction in which he is trying to project it. If he wanted to do the job even more efficiently, he'd use a cone with a mouthpiece — something like a Victorian speaking trumpet or a cheerleader's megaphone.

Let's take a closer look at those sound waves set up by the woodsman's shout and the falling tree. We've already likened them to the ripples in a pond when you drop in a pebble. There's a build-up of air (the crest of the ripple) followed by a partial vacuum (the trough between one ripple and the next). Sound waves travel through air much more rapidly than ripples through water — approximately 750 miles per hour. But like ripples on a pond, when they meet an obstruction — a rock, the shoreline, or floating log — they bounce off. A secondary set of ripples or sound waves mingle with the first to produce intricate patterns. In the case of sound, this is the interplay between direct and reflected (or echo) sound. Not all sound waves are alike. They differ both in amplitude (or size) and frequency.

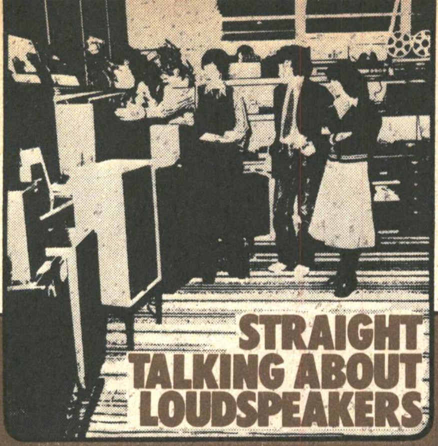
Vibrations in the air

If you watch closely as someone plucks a string on a double bass you can see it vibrate back and forth. The movement is quite slow compared to the speed with which a violin string vibrates. As the thick double bass string vibrates, it creates sound waves similar to those created by the tree in the forest. In fact, the lowest string on the double bass moves back and forth only about 40 times each second, while the thinnest, highest string on a violin vibrates about 500 times per second. In effect, the movement of each string is something like the S we described earlier if viewed in cross section. And the moves of air surrounding it are something like mirror images of the vibrating string.

In other words, to create a bass tone you must put large amounts of air into motion, but at a relatively slow rate of speed. To create high frequencies, the air must move much more rapidly — but there can be less of it.

When we listen to music, we want to hear more than just the E string on the double bass guitar and the violin. In the case of live music, it takes an ensemble of ten or twenty or even 100 players to produce the kind of music most of us like to listen to, using a variety of instruments, all vibrating at once.

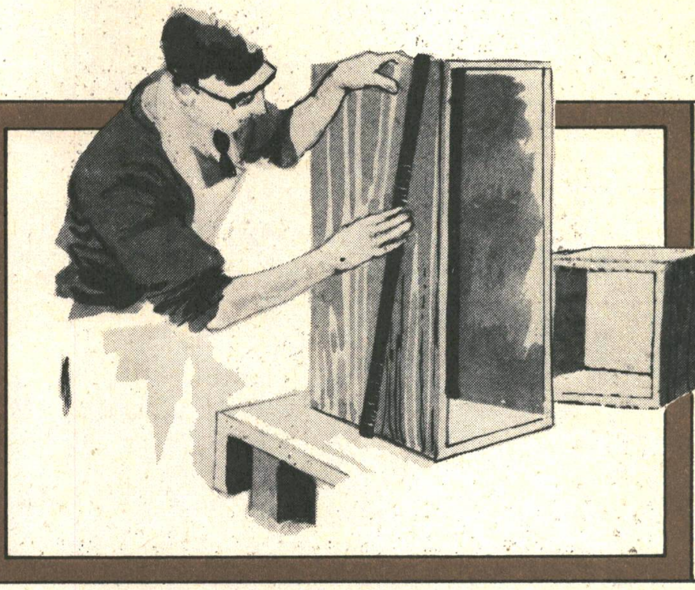
A loudspeakers system has to do all that inside the framework of a box which is often no larger than two cubic feet, and which uses a couple of paper cones to simulate not



STRAIGHT TALKING ABOUT LOUDSPEAKERS

Bob Angus gets down to the physics of loudspeakers and compares the pioneer designs with today's minis

GOOD?



only the sounds of the violin and double bass, but everything in between!

The idea of putting a speaker inside a box actually is comparatively new. The first dynamic loudspeakers — the kind which use an electromagnet to move a paper cone — appeared in the 20s. But it wasn't until the 1930s that people started designing boxes to put them in. And it wasn't until the 1950s that the first sealed speaker boxes appeared. If you've seen a phonograph or radio of the 1940s, you'll have noticed the speaker bolted inside the front panel with no effort made to enclose it.

Why bother? Well, a speaker enclosure is something like the cupped hands around the woodsman's mouth. It projects sound more efficiently into the listening room. The first people to discover this fact were the designers of loudspeaker systems for movie theatres. The early systems designed by James B. Lansing and Robert Stephens were designed to get the most volume out of the relatively-low-powered sound systems of the day rather than produce high fidelity sound. Since the speaker systems were hidden behind movie screens, nobody cared very much about their size. The result was enormous folded horns of wood and flared horns of metal which acted like megaphones to project sound throughout the theatres of the day.

Pioneer achievements

The two pioneer speaker designers Lansing and Stephens, noticed that as the speaker cone moved forwards, creating mounds of air in the listening room, it created a partial vacuum behind. On the return trip, there'd be a partial vacuum in front, but a build-up of air behind. Since nature abhors a vacuum, air would flow around the rim of the speaker from the area of high pressure to that of low. The net effect would be the cancellation of bass frequencies, the ones most affected because they involved the largest build-ups of air.

However, by designing their horns so that the rear waves could be added in phase to those up front, they achieved both good sounding bass and speaker systems which were highly efficient. They did it by designing a "labyrinth" which delayed the rear waves a fraction of a second, then projected them through a hole in the mounting board or "baffle." A baffle, incidentally, is any device which prevents those rear waves from cancelling those up front. Speaker efficiency is an index of just how much of the electrical energy which goes into the speaker system emerges as sound. In the case of high efficiency systems such as those developed by Lansing and Stephens, that's about five per cent — which means that an inefficient speaker system like those developed in Boston in the 1950s used only one or two per cent of the energy fed into it.

Acoustic suspension

Another, less practical, solution to the problem of baffling a speaker, is to use a board big enough to prevent those pesky sound waves from cohabiting. The trouble is that such a board would have to be something like 20 feet x 20 feet — and even that would be good only down to about 30 cycles. So Edgar Villchur and Henry Kloss came up with the idea of bending the board into a box so trapping the rear waves inside. They called it "acoustic suspension", with the speaker cone riding on the cushion of air trapped inside. The sound which resulted was amazingly rich in bass, compared to the earlier folded horns and ducted port systems. But because half the energy generated by the speaker cone was trapped inside the box, it took much more power to produce satisfactory results.

Villchur and Kloss realised, too, that the size of the box was critical. If it was made too small, the speaker cone's rearward motion would be inhibited by the trapped cushion of air, with the result that there would be either very poor bass sound or none at all. Two cubic feet seemed about right for the speakers they were using. The two discovered then what speaker designers have known ever since — that the laws of physics rigidly proscribe the parameters of loudspeaker design. You can decrease size, but at a cost in bass response. You increase efficiency, but you'll also have to increase size or lose bass.

Kloss and Villchur could have used a box 2½ cubic feet in size, thus providing more room inside for the air to move around, and requiring less power to make the speaker cone behave. But the floppier cone probably wouldn't have produced any better bass sound and the whole thing would have taken up more space. Conversely, they could have gone to a box the size of the smaller Advent (both did eventually, but with smaller drivers). That would have meant more compactness, but it also would have meant less bass because of the resistance inside the box, which also would have required more power.

When manufacturers of acoustic suspension systems did move to smaller boxes, they were required also to use smaller reproducers. But the smaller the speaker cone, the less air it can move, which means that it produces less acoustic power. This loss of acoustic power is particularly noticeable in the bass.

Smaller enclosures

ADS, Braun and other manufacturers have recently demonstrated that it's possible to build speaker systems as small as 17.5 x 10.75 x 10.75 cms (6⅞ x 4¼ x 4¼-inches) but they really don't have much usable bass below 100 cycles, and they do eat up relatively large amounts of power.

Acoustic suspension permits the use of smaller enclosures — at least with ample bass — than does the bass reflex design.

The question of what constitutes a "small" speaker also is somewhat relative. To a well-heeled audio purist, any speaker system smaller than a six-feet-high Klipsch corner horn is "small". To older audiophiles, who remember the era of build-it-yourself, the two-cubic-foot system in common use today is small; and most audio buyers used to the two-cubic feet format consider mini-bookshelf models like the AR17, Smaller Advent or Dynaco A25 to be small. By any standards, speakers like the ADS 200 or Visonik Little David are very tiny indeed. It doesn't take an audiophile's ear to tell that the last group offers less bass than the mini-bookshelfs, which in turn provide less bass than the standard bookshelf models from the same manufacturers.

International Summer Consumer Electronics Show
morse

ESOTERIC

DAVE BERRIMAN VISITS THE CONSUMER ELECTRONICS SHOW IN CHICAGO

WITH over one thousand brand names at the Chicago Consumer Electronics Show last June, it's not surprising I collected a pile information a foot high (and that's after weeding out the obvious rubbish!). In Chicago came the horrific realisation that there was even more mass-produced, so-called hi-fi (did someone say, junk?) than I'd ever dreamed in my worst nightmares, but there was also a very select band of small manufacturers who seem to know how to reproduce music, rather than sell brushed aluminium fascias.

Obviously we do not want to endlessly reproduce all the mind-congealing information gathered from the CES in this short space, so we must be selective. Trouble is sorting out the wheat from the chaff — manufacturer's selling blurbs vary from pseudo-scientific to neo-mystic! The sound's the thing of course, but first impressions at shows can be very misleading.

My selection of products is based on sounds which I liked (not many) and things that caught my eye for one reason or another. For interest's sake, I have also concentrated mainly on products which are unlikely to be seen at forthcoming UK shows.

Stateside readers who were at the show should not take that as an inference that everything else is worthless rubbish — I certainly didn't hear and see everything.

LOUDSPEAKERS hold a special fascination for me and, anyway, the less subtle colorations and distortion of these transducers are easier to hear than with other parts of the chain. Even so, when listening at an exhibition — or anywhere for that matter — you're also hearing the auxiliary gear right down to the wires and turntable mat, and that makes judgements difficult. However, one sound which did stand out was from the **Snell Acoustics Model A** loudspeakers (now imported into the UK by Michaelson and Austin). This has downward-facing woofers and midrange and tweeter units front-facing. Drive unit positioning avoids cancellations due to wall and floor reflections (as in the Allison and recent AR models). Their sound is best characterised as dynamic, detailed, relaxed and tonally natural — a loudspeaker for listening to music. Should be good at 1,680 dollars per pair.

Making my way into the **Audionics** of Oregon room, I discovered a very pleasing sound coming from four (yes, four) **DCM 'Time Window'** loudspeakers driven by Audionics' 150 watt DA150 analog-digital amplifier. This beast uses cmos digital circuitry to adjust the bias of the tubes (sorry, valves!) during quiet passages and allows a high output with cool class B running of the output valves. I had also been listening to their **'Space and Image Composer'** (essentially a **Tate** SQ decoder) and though I've never previously heard a quadraphonic system that I liked, I must admit to being impressed with the sound of this one. It could have just been that record I suppose.

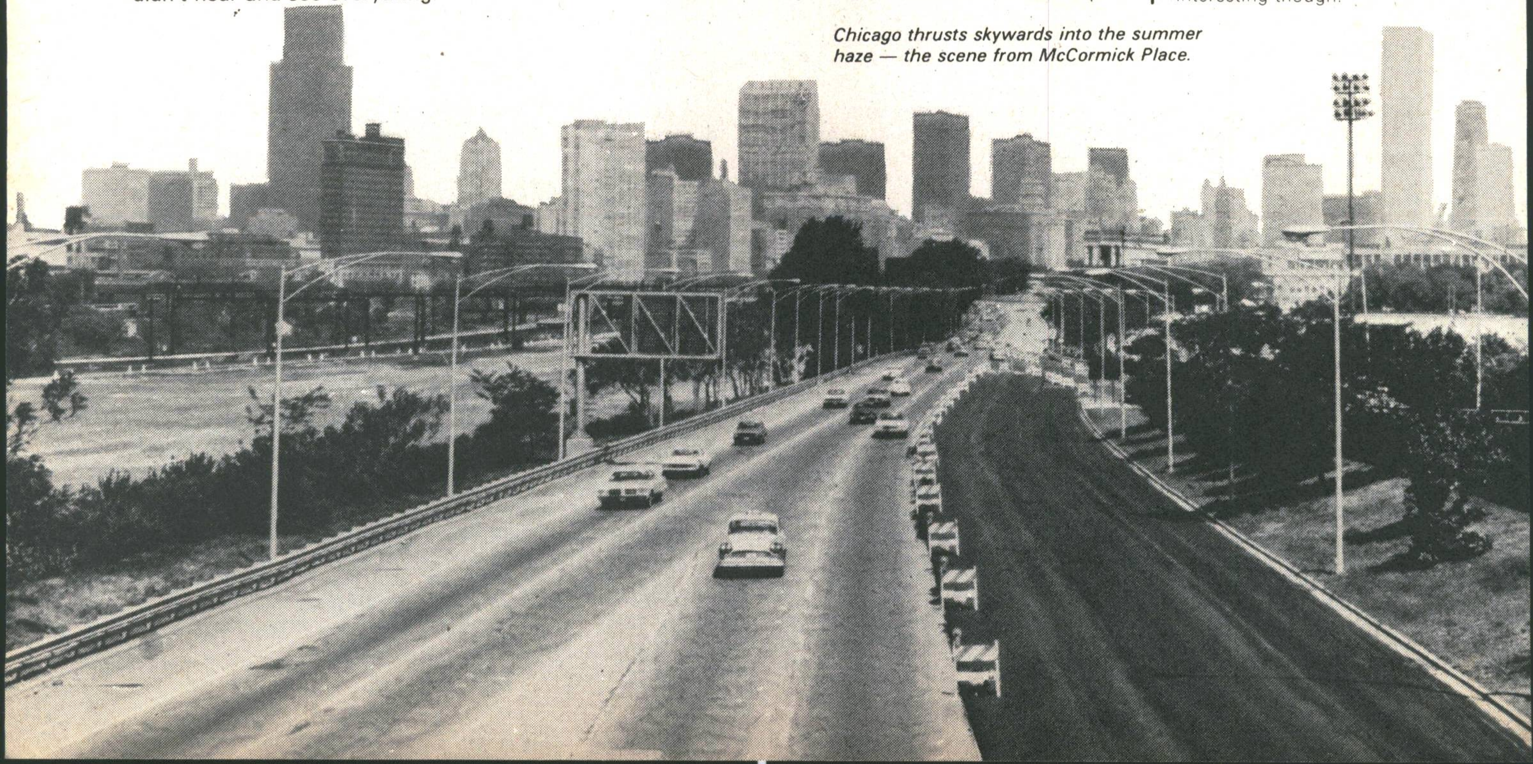
Rest of the system helped no doubt: **Win Labs** turntable (cropped up a few times this one), **Grace** arm with **Linn Asak** cartridge. Looking at the price tags of the Audionics gear I would expect a good sound. The DA150 costs 2,950 dollars; their BT-2 pre-amplifier cost 459 dollars; while the Composer is priced at 795 dollars.

Returning to the DCM Time Window, this floor-standing model is inexpensive by American standards at 660 dollars a pair. It's also had enthusiastic reviews in the American underground press. As the name suggest they have been designed with impulse response in mind and actually reproduce pulses and squarewaves remarkably well — if you believe their literature. Also shown by DCM was their **QED** loudspeaker at 480 dollars a pair, and an add-on bass unit, the **DCM Timebase** at 770 dollars a pair.

Of interest to electrostatic loudspeaker fans are the **ES Translators.** These incorporate a moving-coil bass unit and an inside-out electrostatic radiator with *two* diaphragms on the *outside* and *one* fixed plate on the inside. They're also self-healing and self-powered, so they don't need a mains-derived power supply and are claimed to go as *'loud as you like'*. Certainly interesting, though I didn't listen long enough to form an opinion about the sound.

Loudspeakers I didn't hear are the **Metronome 2+2W** from the **Pyramid Loudspeaker Corporation.** Shaped as their name suggests, they cost 4,000 dollars per pair. The *Metronome 3* is a lower cost model at 1,200 dollars a pair, using a ribbon tweeter, while the *Pyramid +1*, designed by Richard Sequerra, is an add-on ribbon tweeter with a 5 lb magnet, a power handling of 200 watts pink noise and a response from its 3kHz crossover to 100kHz! Cost is the only problem at 1,175 dollars per pair — just for two tweeters! Against this the **Decca** ribbon super tweeters at 200 dollars each seem a good buy, but to this hack it's still a lot of money. The Decca has no horn and works from 7kHz upwards — sounds interesting though.

Chicago thrusts skywards into the summer haze — the scene from McCormick Place.



HI-FI IN USA

EAR TO THE GROUND

KLH released three new computer-controlled models, the KLH3, KLH2 and KLH1 (shortly to be reviewed in PHF) with a non-computer model the KLH4. Idea of using a computer is to get a lot of bass from a small box. Certainly the openness and sweetness of the smallest KLH3 was exceptionally good, though I thought the bass of all three computer-controlled models just that bit strange.

Unconventional is one word for the **Cosmos Electrostatics/ Shahanian Dynamics Omnistatic.** This uses an umbrella-shaped array of electrostatic radiators under a protective grille and a dynamic passive-radiator-loaded bass system. The claim is for a spacious sound and it certainly was extremely open, though the material played didn't allow me to assess stereo imagery. Cost? A mere 3,600 dollars per pair!

Rounding up extraordinary loudspeakers was the technologist's dream — the **Hill Type 1** plasma loudspeaker system. From 700Hz up, a plasma, energised by a dc voltage and fed by minute quantities of helium gas, provides the sound. Below that, two drivers provide output. So, above 700Hz the only things moving are hot air molecules — no diaphragms — and amplification is by valves in class A. The otherwise wasted energy from this form of biasing is cleverly used to energise the plasma. Every 300 hours you need to replace the helium, though, and cost is going to blow your mind at a trifling 7,000 dollars a pair. Distortion, tone burst and frequency response are remarkable. The sound? Well, it was pretty open, much like a good electrostatic — but, oh, the smell of ozone from the plasma!

Power on tap

There's no shortage of unusual ideas in the amplification field. A prime example comes from **Spatial Inc** with their **TVA-1** pre-amplifier using Richard P. Knapp's *Translinear Field Effect Transconductance Valve* or *TFET-Valve*. Initially, it's hard to tell if the device is an invented term for something quite unoriginal (*ie*. a load of old bull) or a remarkable invention. The claim is for a new form of field effect device which is much more linear than valves, fets or transistors, indeed, which is so linear that it needs *no* feedback whatsoever and which radically lowers what the inventer calls noise intermodulation or NIM. As a result the **TVA-1 Spatial Coherence** pre-amplifier is claimed to give a better sound with better stereo imagery, etc. Certainly, on hearing the pre-amplifier driving a **Michaelson and Austin TVA10** power amplifier I was reminded of a good valve pre-amplifier with much clarity and naturalness. The TFET valve could be the spoof of the decade or the work of a genius, I don't know, but suspect we will hear more of Richard Knapp!

The **Berning TF10** pre-amplifier was one item I didn't hear, but the TF10 uses a novel patented hybrid technique (not disclosed by Berning) of using valves, transistors and ics together to achieve a very linear transfer characteristic while using only 6dB to 10dB of local feedback.

More than 10dB of feedback, they say, and the sound begins to deteriorate. The TF10 is claimed to reproduce the *'overtone structure in a way that no feedback type pre-amplifier does'*. I don't know the cost of the TF10 but the concept looks very interesting.

Another interesting design is **David Hafler's DH200** 100 watt-per channel kit power amplifier. Using power fets as output devices. The design is claimed to minimise interface intermodulation distortion due to back emf from the loudspeaker (or IIM as described by Matti Otala), and the electronic sections are pre-assembled so that only the mechanical assembly and some simple input and power supply wiring are required. It's also available ready built. Cost is not known, but for those interested, the DH200 will be distributed in the UK by Howland West.

Extraordinary is the word for the **Carver M400** *'magnetic field power amplifier'* — a 200 watt-per-channel design weighing only 4kg (8¾lb) and costing 349 dollars. The amplifier uses field effect transistors throughout, apart from the output devices (special silicon — presumably bipolar — transistors). As far as I can gather the ridiculous size and weight are due, to the use of a form of switching power supply. Thus the usual bulky transformer and smoothing capacitors are not required, only a small coil to store the field. However, when questioned on this point, the Carver guy clammed up and muttered something about patents.

How's this for a specification? *'Distortion very low, bandwidth very wide, noise reasonably quiet'* and so on. **Van Alstine** is the company, the product is their **Model One** pre-amplifier. Withdrawing from the great audio numbers race, yet not descending into the mire of technomystics, VA systems claim to make a pre-amplifier which *'sounds like a vacuum tube pre-amplifier with a response from dc to light'*. Their model one is the cheapest (at 600 dollars) of seven models, the dearest is 840 dollars.

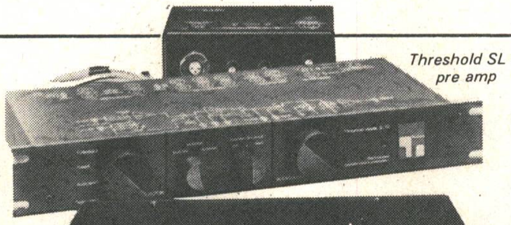
Threshold's products include their newly launched **STASIS 1** power amplifier costing 3,000 dollars, featuring *seventy two* (not a misprint!) ultra-fast output transistors and rated at 150 watts. Basic concept of STASIS operation (patented) is of a feed-forward circuit with a constant voltage and constant current source in parallel. Their SL10 pre-amplifier has a 200MHz bandwidth, 200,000 microfarads power supply decoupling and so on. No wonder it costs 943 dollars! The **Threshold 4000** 'super power amplifier' responds up to 4MHz and has a dissipation reserve (whatever that means) of six kilowatts!

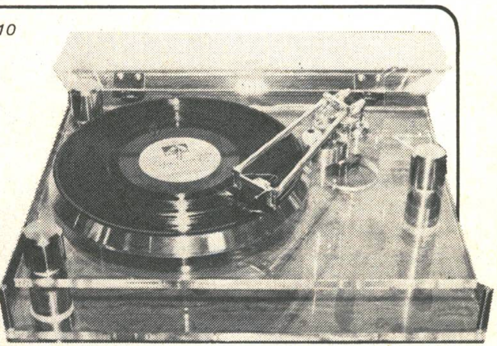
Operation is in their very own dynamic Class A mode and the price? 2,160 dollars. Similarly their **Model 400A** Class A power amplifier offers 100 watts for 1,395 dollars and finally their **CAS2** 100 watts per channel power amplifier costs a mere 895 dollars. A common feature of most of these designs is the extensive use of cascode circuitry and multiple output devices. All transistors are individually selected for linearity using curve plotters and their high-quality technological blockbuster approach is obviously reflected in the prices.

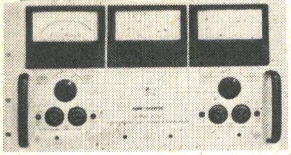
I could go on and mention in detail **SAE**'s **Hypersonic** Class A power amplifiers, the metal-tape-compatible **Nakamichi 680** half-speed cassette deck and the **Nakamichi** add-on version of **Telefunken's** *HiCom II* noise reduction unit. Then there's the vast range of **Audio Research** valve power and pre-amplifiers. Power and pre-amplifiers from **APT Holman,** new loudspeakers from **ESS** and **Dayton Wright** (the XG10), **Allison Acoustics'** models, a small loudspeaker from **Dahlquist** (who were also using **Radford TT100** valve power amplifiers), not forgetting the many British exhibitors. However, there's just not enough room.

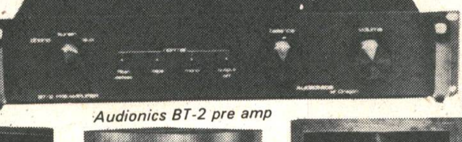
If the big electronics show at McCormick Place numbed the brain, at least the atmosphere at the Pick Congress hotel ventilated those tired grey cells more than a little.

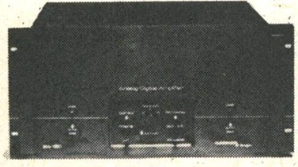
Threshold Stasis 1 power amp

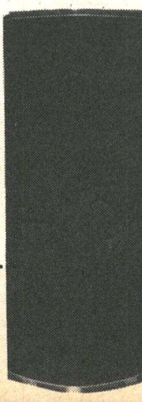

Threshold SL 10 pre amp

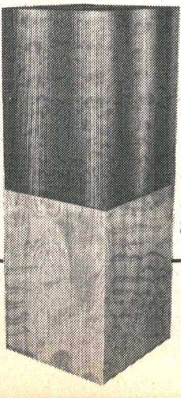

Win Labs turntable and prototype arm

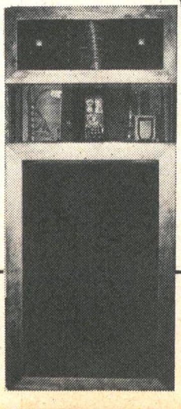

Left: Audio Research D79 power amp


Audionics BT-2 pre amp


Audionics BA 150 valve amp


DCM Time Window


Shahanian Omnistatic


Hill type 1

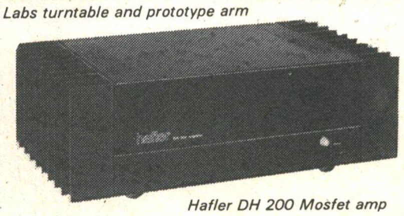
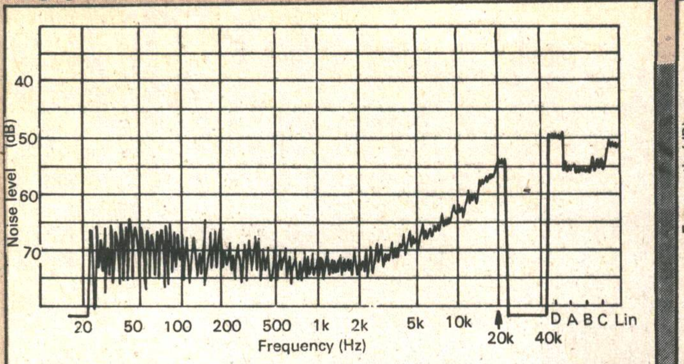
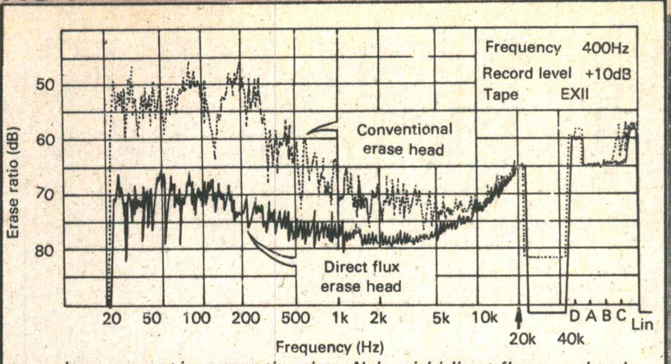

Hafler DH 200 Mosfet amp

FIG 1



Noise spectrum from a bulk-erased tape

FIG 4



Improvement in erase ratio using a Nakamichi direct-flux erase head

FIG 2

Typical erase head of normal construction

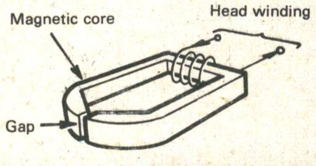
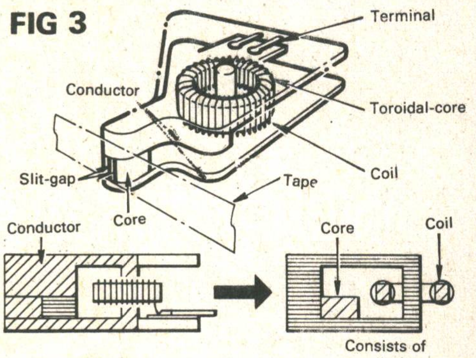


FIG 3



Nakamichi's direct-flux erase head

DESIGNING A CASSET

COMPARING the performance of a cassette recorder with that of an amplifier is, at first sight, worse than comparing a cassette recorder with a studio reel-to-reel recorder. Or is it? In fact, our methods of assessing amplifiers seems to have subtly changed in recent years. Before that time, a fairly well established regime of measurements had always been sufficient to establish the qualities of an amplifier. Now it has been appreciated that there are some aspects of the performance of an amplifier which are not described by normal measurements, and so listening tests have assumed considerable importance. At times I have felt that too much weight has been placed on them because the large majority of the tests have been poorly-founded and badly-analysed. Nevertheless, information has emerged which suggests that the gap between measurement and sound quality is too great and the time has come to dig deeper into what makes a good amplifier.

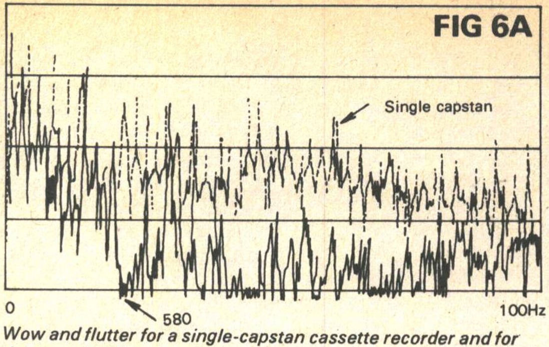
Fortunately for amplifier enthusiasts, this is beginning to happen and even if the knowledge that is being acquired now is a rediscovery of old and forgotten principles, that cannot be a bad thing. The point of all this is quite simply, there is a lesson to be learned for other parts of the hi-fi chain, not the least of which is the cassette recorder. A very few cassette recorders already achieve a performance which two years ago would have been considered science fiction. Yet it is still difficult to conceive how, with all its inherent faults, cassette performance can be further improved. This is particularly so when one realises that much of the improved performance has arisen not through the application of radically new techniques, but simply through a refinement of existing ones.

The most important improvements have come from the adoption of the Dolby and other noise-reduction processes and the development of new high-coercivity tape coatings such as those based on chromium dioxide or cobalt-modified iron oxide. Making useful steps beyond those is going to be difficult, at least until the much-vaunted metal tape becomes available. Even then a cautionary note needs sounding, since the difficulties of making a tape with consistent high-frequency performance and with few drop-outs, is reaching the limits of the tape manufacturer's skill at the moment.

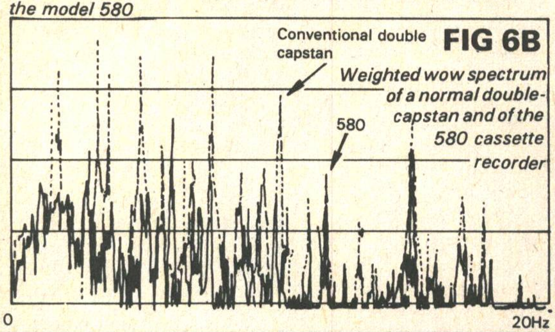
One rather obvious route to improving the reproduction of cassette recorders is to listen to them and experiment with various changes, observing audible improvements which may not show up in measurement. We know this can work with amplifiers, why should it not be true of the cassette recorder? One company that has already adopted this rational approach to the design of cassette recorders is **Nakamichi.** Recently they opened the *'Nakamichi Sound Research Centre'* with the objective of obtaining a better understanding of the way that listeners react to both live and recorded sound. In the process they hope that some clues will be given of obvious areas where the cassette recorder can be improved without too many radical changes likely to cause incompatibility with the system as a whole.

A typical example of an improvement in performance, bought at the expense of incompatibility, is the idea of increasing the speed of the tape in the cassette recorder, *viz* the American BIC now available in Britain. This offers the obvious improvement in high-frequency performance and dynamic range, but the tape cannot be replayed on any other standard machine. In addition, the playing times of standard cassettes are halved, something which is extremely undesirable.

Evidence of the success of the former

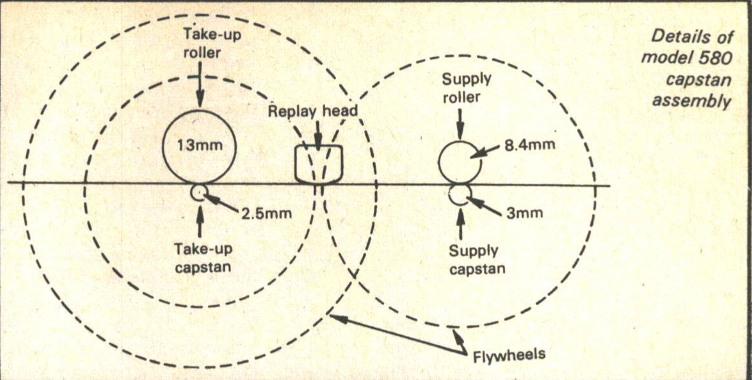


Wow and flutter for a single-capstan cassette recorder and for the model 580



Weighted wow spectrum of a normal double-capstan and of the 580 cassette recorder

FIG 5

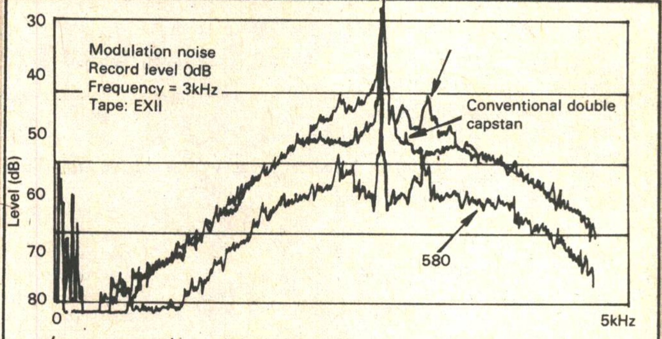


Details of model 580 capstan assembly

TE DECK FOR HIGH PERFORMANCE

by Basil Lane

FIG 7



Improvement in modulation noise obtained by changes in tape transport

approach to recorder design may be found in the Nakamichi 580 cassette deck demonstrated to the European market for the first time in Paris.

Two obvious target markets had recently emerged, one being the need to design a machine suitable for pure-metal tapes, the other to produce a machine of Nakamichi standards at a price lower than they had achieved before, as outlined by Eddie Nakamichi in the interview we published in the May '79 issue. This was where the advantages of listening tests began to have some effect. Due to the high-coercivity of metal tape, the erase head in the recorder has to develop a high magnetic field to remove any previous recording. Nakamichi developed such a head, using conventional techniques, which was effective enough to reduce the weighted noise figure of a recorded tape down to that of the bulk erased tape. However, the listeners at the research centre still appeared to be able to consistently identify tapes which had been recorded using bulk-erased tapes passed through the machine without the normal erase head working, and those that had been previously recorded and then passed over the machine's erase head and recorded again. Why?

This was where the advantages of a modern laboratory showed itself, since Nakamichi had recently purchased the latest real-time narrow - band spectrum analysis equipment, in the belief that conventional measurement methods were insufficient. An examination of a factory bulk erased tape, and one that had been erased by a tape machine erase head, showed significant differences in the noise energy at low frequencies. Checking back over other types of tape having a lower coercivity, showed that the effect existed in conventional high-coercivity tapes and to a lesser extent in low bias tapes. Clearly, if an erase head was designed solely to remove the recorded signal, it was still leaving behind a noise residual at low frequencies.

Why should this make any difference to the audible quality of a recording? Obviously the dynamic range of the tape at low frequencies was being altered, but this was insufficient to explain the observed effects. Further investigation revealed that modulation between the recorded signal and the residual noise on the tape was considerably reduced when the tape had passed through a bulk eraser. Immediately, this suggested a simple answer which would undoubtedly improve the audible performance, although the results would almost certainly not show when using the standard methods of overall weighted noise measurement, adopted for the specification.

Improving the performance of an erase head seemed obviously simple since it only needed an increase in the current flowing in the head winding, and more flux would be available. But it was not to prove quite so simple in practice. To understand the difficulty, consider first an erase head of fairly conventional design (*Fig 2*).

Magnetomotive force is first produced by current flowing through the coil wound

DESIGNING A CASSETTE DECK FOR HIGH PERFORMANCE continued

around a magnetic core. The presence of the core serves several purposes; first it confines the magnetic flux to an area close to the coil and largely within the core itself, thus reducing flux leakage elsewhere; second the core produces a sympathetic magnetic flux which adds to that of the coil and third, the core serves to direct the flux to the tape surface. If the core were a continuous magnetic circuit, then the flux produced would be largely confined to the core and little would appear in the tape. To get over this, a small gap is introduced which the magnetic flux has to cross in order to complete its circuit. It is here that the tape passes and the leakage flux in front of the gap is used to erase the tape.

Within certain limits, increases of current in the winding will produce corresponding increases in the core flux, but there is a limit and that comes when all the small magnetic dipoles in the core are aligned in sympathy with the flux produced by the winding. After that, increases of current in the winding fail to produce corresponding increases in core flux. Choosing a better core material helps to a certain extent, but even the best available are being pushed almost to the limit of saturation to obtain the necessary erase flux fields for metal tape.

The solution to the problem, as adopted by Nakamichi, could be fairly called a 'brute force' one since it went back to the origins of the magnetic flux as a way of getting still higher fields. Although increases in the current in the head winding appears to produce no increase in flux once the core has saturated, in effect, the flux around the winding *does* increase proportionately with the increases of current. All that was needed was to get a very high current flowing through the coil, take away the normal core, get the tape close to the conductor and the problem is solved!

The practical solution was actually a little more complicated than that however, since obtaining the high current from normal bias oscillators would have required a substantial power amplifier and power supply. The method eventually used is shown in *Fig 3*. Here, the erase head is also a transformer. A small current flowing in the toroidal core produces a surrounding flux field which cuts across a solid metal conductor passing through the centre of the coil. The conductor is formed into a single turn winding and thus acts as the secondary of the transformer. Since the turn ratio between the primary and the secondary is large, the current in the metal conductor is also very high, rising to a maximum of about ten amps! The edge of the conductor is in contact with the tape and thus the field that surrounds it penetrates the tape coating to erase any recording. Final shaping of the flux field and the shielding necessary to prevent leakage of the field to the record/replay head, is obtained by fitting a magnetic pole piece around the conductor at the point of its contact with the tape. Since it plays little or no part in the *generation* of the erase field, it need not be closely coupled to the conductor and so two small gaps are left between it and the conductor.

The result of the complete design excercise is an erase head with a considerable margin of power to erase even metal powder tapes down to the same noise level as a factory bulk erases. Although the 580 cassette recorder is not otherwise designed for metal tape, the improvement in the sound obtained with conventional tapes is quite noticeable.

A second area which Nakamichi thought was worth examining, related to the modulation of wow and flutter components with the recorded signal. Careful narrow band analysis of a good single capstan and a good double capstan drive system revealed that although the double capstan unit achieved a better weighted wow and flutter figure, there were marked peaks in the measured spectrum. It was concluded that these arose because the two capstans, two pinch rollers and two flywheels were all of the same size and rotating at the same speed. This caused a matching in system resonances which produced the large peaks.

Redesigned components

The solution adopted in the 580 cassette recorder, was simple and consisted of redesigning these components to have differing sizes; thus the take up capstan is smaller than the feed capstan, the flywheels are different diameters and so are the pinch wheels. The performance is shown in *Fig 6*. Although this significantly reduced the effects of wow, Nakamichi felt that it was worth also attempting to reduce the effects of flutter still further. He concluded that as the capstan system had been subject to resonances, perhaps flutter was accentuated by vibrations from other moving parts such as the motor, being transmitted *via* the chassis to the heads and the capstan assembly.

In the 580 cassette recorder, the chassis assembly has therefore been designed to damp these vibrations and consists of a diecast aluminium frame containing over forty plastic inserts. The results speak for themselves, in the improvements in modulation noise shown in *Fig 7*.

CUT ME OUT TO CLAIM THESE ULTRA SPECIAL DISCOUNTS All offers subject to stocks at time of going to press (6.5.80) being unsold.

5 YEAR GUARANTEE

THIS MONTHS FREE OFFER
ORDER ANY 12 CASSETTES (INC. FREE ONES) AND ASK FOR **FREE!** 1 C90 AGFA HIGH ENERGY *(Mail order only).*

ESTUARY AUDIO THE LEADERS IN **CUT PRICE TAPES**

Attach this advertisement to your order or bring it with you to claim these ULTRA SPECIAL DISCOUNTS

Save on Chromium Dioxide
C60 £1.05
C90 £1.27

chromium dioxide 90

Fantastic Introductory Offer! Genuine C_rO_2 at an incredible saving. High Coercivity; High Frequency Response; High Output; Low Print-Through; Low Dropout. NO RISK OFFER! If not delighted return your Leda C_rO_2 within 30 days for a full cash refund.

SPECIAL OFFER
Buy 3 Leda C_rO_2 and ask for 1 (same size) **FREE!**

Agfa

BONUS!

MAIL ORDER ONLY
BUY 10 AGFA HIGH ENERGY AT THESE PRICES & ASK FOR 3 C90 TAPE 7 SUPER SOUND CASSETTES
Absolutely Free

EXTRA SPECIAL BONUS
BUY 20 AGFA HIGH ENERGY & ASK FOR 10 SPECIAL C90 TAPE 7 SUPER SOUND CASSETTES Free

	C48	C60	C90	C120
AGFA High Energy	–	59p	79p	99p
Agfa SFD1	–	85p	£1.13	£1.49
Agfa Carat	76p	£1.08	£1.47	–
Agfa Ferro Colour	–	56p	76p	£1.14

GENUINE NEW SUPERCHROME AT A PSEUDO CHROME PRICE

	C48	C60	C90	C120
Agfa Superchrome	–	£1.18	£1.59	–

REEL-TO-REEL

5"	900'	LP	PE36	£1.92
5¾"	1200'	LP	PE36	£2.19
7"	1800'	LP	PE36	£3.14
5"	1200'	DP	PE46	£2.28
5¾"	1800'	DP	PE46	£3.14
7"	2400'	DP	PE46	£3.86
5"	1800'	TP	PE66	£3.58
5¾"	2400'	TP	PE66	£4.70
7"	3600'	TP	PE66	£4.95
10½"	4200'	Cine	PE36	£8.43
10½"	4200'	NAB	PE36	£9.71

Agfa PEM (matt)

5"	900'	LP	£2.73
7"	1800'	LP	£3.84
10½"	3600'	Cine	£8.70
10½"	3600'	NAB	£10.50
5"	1200'	DP	£3.55
7"	2100'	DP	£5.96
10½"	4200'	Cine	£10.12
10½"	4200'	NAB	£12.14

ALL ORDERS POST FREE BY RECORDED DELIVERY

TDK SONY BASF

	C46	C60	C90	C120
BASF LH	–	54p	73p	£1.19
BASF Super	–	88p	£1.19	£1.55
BASF Ferro Super 1	–	99p	£1.30	£1.79
BASF C_rO_2	–	£1.21	£1.52	£2.23
BASF F_eC_r	–	£1.46	£1.90	–
Hitachi LN	–	58p	82p	£1.18
Hitachi UD	–	95p	£1.14	£1.54
Hitachi UDER (UDXLI)	–	£1.26	£1.58	–
Hitachi UDEX (UDXLII)	–	£1.26	£1.58	–
Maxell UL	–	58p	80p	£1.02
Maxell UD	69p	77p	£1.10	–
Maxell UDXLI	–	£1.22	£1.51	–
Maxell UDXLII	–	£1.22	£1.68	–
TDK 'D'	59p	67p	89p	£1.22
TDK AD	86p	95p	£1.29	£1.77
TDK OD	–	£1.09	£1.58	–
TDK SA	–	£1.16	£1.69	–
YASHIMA UFO +	49p	59p	79p	£1.09
YASHIMA UFOI	–	96p	£1.28	£1.64

ASK FOR ONE YASHIMA UFOI (same size) FREE WITH EVERY THREE YASHIMA UFOI YOU BUY
YASHIMA UFOII (High Bias) £1.10 £1.64
BUY 2 C90 YASHIMA UFOII and ask for 1 FREE!
BUY 3 C60 YASHIMA UFOII and ask for 1 FREE!

REEL-TO-REEL * SPECIAL PACKS ONLY LIMITED STOCKS

	7" LP 1800'	7" DP 2400'	10" LP 3600'
BASF LH	£4.50	£5.80	–
Black Box Studio	£2.12	–	–
TDK Audua	£3.65	–	£10.74
TDK Audua (matt)	£4,42	–	£12.06

VIDEO PHILIPS Format (Agfa)
VC30/60 £9.18; VC45/90 £9.40 VC 60/130 £12.50
VHS Format: VHS60 £6.10; VHS120 £8 10; VHS180 £9.35
BETAMAX Format: L500 £7.25 ; L750 £9.45

FUJI FILM Recommended by Aiwa · Akai · Alpha · Audiotronic · Beltek · Hanimex · JVC · Marantz · NAD · Pioneer · Rotel · Sansui · Teac · Toshiba · Trio

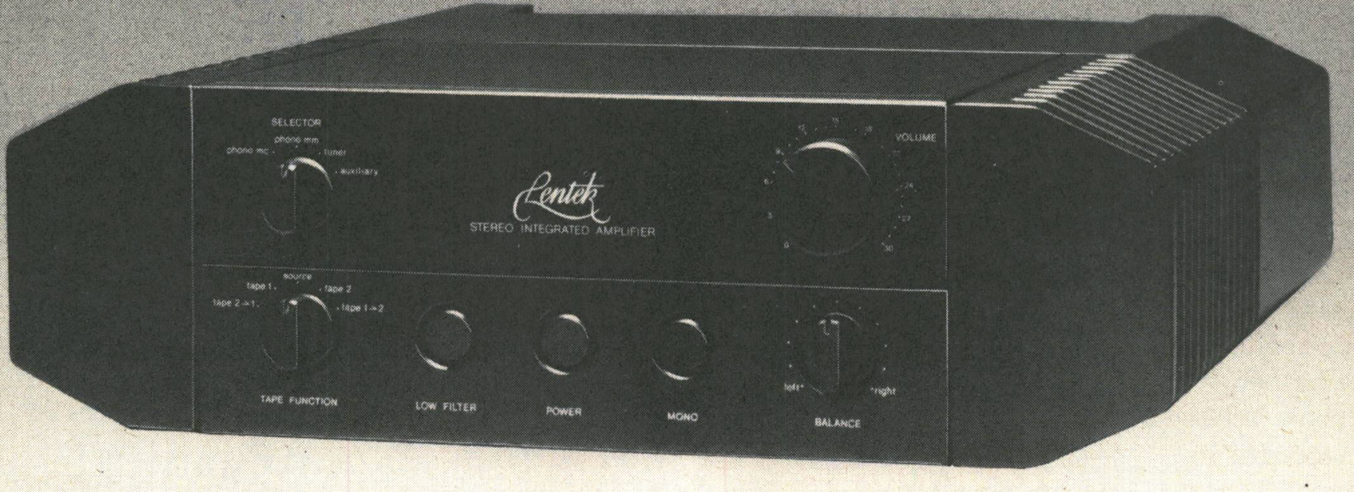
FL SUPER	C46 50p	C60 55p	C90 70p	C120 £1.06
FX-I Pure Ferrix (normal position)	C46 71p	C60 85p	C90 £1·08	
FX-II Beridox (chrome position)	C46 88p	C60 £1·08	C90 £1·35	

The New SONY range
CHF – New Super LN
C60 .... 56p
C90 .... 77p
C120 .... £1.05
CD Alpha – Super Pseudo Chrome
(XLII/SA type) (C_rO_2 switching)
C60 .... only £1.07
C90 .... only £1.40
F_eC_r – Ferrichrome
C46 .... £1.06
C60 .... £1.29
C90 .... £1.62
AHF – Super Ferric *Plus!*
(XL1/OD type) (Normal Position)
C46 .... 75p
C60 .... 85p
C90 .... only £1.10
BHF – New Super Ferric (HF type) (Normal Position)
C60 .... 76p
C90 .... 91p
C120 .... £1.12

All orders POST FREE – mail to: ESTUARY AUDIO, Dept. OF , 1a HIGHBURY STN., HIGHBURY CORNER, LONDON N5.(Callers welcome)

LONDON EC2	LONDON N5	LONDON WC2	LONDON SE14	BIRMINGHAM	LEEDS	SHEFFIELD 2	MANCHESTER 3	BRISTOL	ESSEX
MASONS AVENUE 30 COLEMAN ST. (01-606 4102)	HIGHBURY STATION HIGHBURY CORNER (01-607 0644)	LEICESTER SQUARE STATION Ticket Hall (Cranbourn St. Exit) (01-439 9210)	NEW CROSS GATE STATION (01-691 7294)	BULL RING SUBWAY (Moor St. Station exit – off Open Market) (021-643 1766)	62 WELLINGTON ST. (off City Square) (0532-444 692)	206 LONDON ROAD	6 VICTORIA STATION APPROACH (061-832 4592)	29 DENMARK ST. (Behind Hippodrome) (0272-290900)	113 RECTORY GROVE LEIGH-ON-SEA (0702-712861)

Lentek



STEREO INTEGRATED AMPLIFIER

If you're searching for an amplifier to use with the best ancillary equipment, look no further, our amplifier is now available. It won't produce an aggressive or confused sound even under the most adverse operating conditions. It amplifies the input signal without adding colouration, and provides all the facilities you're ever likely to need, including phono inputs that can be matched to any moving coil or moving magnet cartridge by programmable switches.

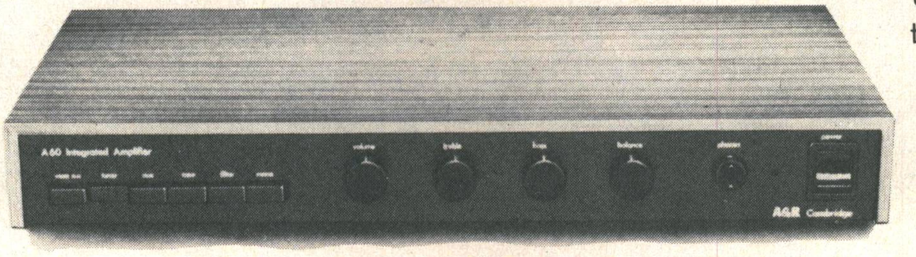
Write or telephone and we'll send you a data sheet and the address of your nearest dealer.

Lentek Audio Limited
Edison Road Industrial Estate St Ives Huntingdon Cambridgeshire PE17 4LF England
tel St Ives (0480) 62225 telex 32303

BEFORE SPENDING MONEY ON AN AMPLIFIER, SPEND FIVE MINUTES ON THIS.

If choosing an amplifier from the vast array available seems a daunting proposition, maybe we can help.

No doubt the four main areas you are probably most concerned with are sound quality, reliability, compatibility and style. And the governing factor for all of these is obviously value for money.



Well, for less than £200 you need look no further. You've just been introduced to the A60 amplifier.

Allow us to tell you more.

SOUND QUALITY

Almost unbeatable — at any price. Each channel of the A60 delivers a generous 35 watts. What's more, the A60 will continue to produce a beautifully clean sound when presented with the most awkward loudspeaker loads, even when driven into moderate clipping.

This performance is the result of many years of painstaking research, experiment and listening tests. Long term consistency of such quality is ensured by the use of high grade components throughout.

RELIABILITY

Renowned for it. The entire amplifier is hand built on a single printed circuit board and is meticulously inspected. Each A60 is tested exhaustively and every specified parameter is checked and recorded. Every A60 also undergoes a lengthy soak test at much higher power than will occur in normal use, before being tested yet again.

Only then do we allow it to be sent out to the A & R Cambridge dealer network.

FLEXIBILITY & COMPATIBILITY

All the facilities you need — no more and no less. As well as a choice of four inputs the A60 also features two tape outputs so you always get the best out of your tape recorder. The disc input will accept any magnetic or "high output" moving coil cartridge. As a bonus, you can optimise the load impedance presented to these cartridges by using our range of passive loading modules. Finally you can now use "low output" moving coil cartridges with the A60 simply by adding our HA10 moving coil-cartridge pre-amplifier.

STYLE

Another plus from the A60. Modern sleek profiling ensures harmony with whatever type of room setting you have. The fascia is in matt black, while the sleeve is available in a choice of teak, walnut, rosewood or matching matt black finishes.

VALUE FOR MONEY

The A60 is not the cheapest amplifier on the market, but every amplifier that even approaches the A60 in sound quality and reliability usually costs much more.

If you would like to know more, spend an extra minute filling in this coupon. Mail it to us and we'll send you a free A60 brochure.

Better still, spend half an hour or so with your nearest A & R CAMBRIDGE appointed dealer who'll gladly demonstrate it for you.

A&R
(Cambridge)
Sound Reliability.

French's Mill, French's Road, Cambridge CB4 3NP.
Telephone: Cambridge (0223) 354507

Please send me a free brochure on the A60 amplifier.

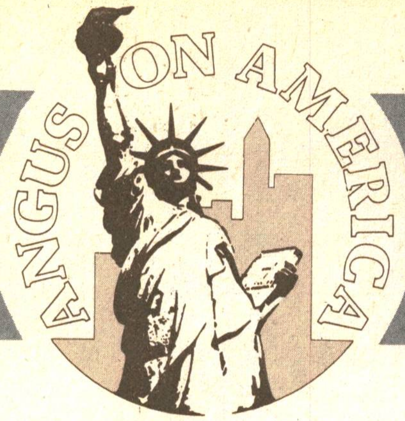
Name ______________________________

Address ______________________________

____

____

Amplification & Recording (Cambridge) Ltd
French's Mill, French's Road, Cambridge CB4 3NP.
IPC1



EVERY month America's top audio writer BOB ANGUS keeps you informed on what's happening on the US hi-fi, video and electronics scene. And remembering it usually happens to them before it happens to us, what Bob tells us is worth knowing!

In Cadillac hi-fi

JONAS Miller is a dyed-in-the-wool audiophile who's spent the best part of his adult life in the quest for better sound reproduction. For the past eleven years, he has operated his own audio salon on Wilshire Boulevard in Beverly Hills, California, catering to the needs of the very wealthy and the very particular.

Miller's other interests include companies which produce direct-cut and digital recordings (M & K RealTime Records, in fact, is one of the few companies with its own Neumann lathe and Sony 1500 PCM recorder on the premises) and manufactures subwoofers and electronic crossover networks.

'I've met most of the challenges of audio during my lifetime, and I feel I've solved most of the problems', Miller said recently. *'With the time left to me, I'm going to try to do the same in cars'.* Miller is one of a growing band of hardcore audiophiles who believe that it's possible to create the same kind of high-fidelity systems in cars that his customers have in their living rooms.

'The only difference is that there are problems to be solved, in terms of road noise, the interior space of the car, and the equipment that is available'. Miller earlier this year started designing and installing car stereo systems whose performance specifications match those of better home audio systems — *'and we have the test equipment to prove that they meet the specs',* he says.

A typical Miller car audio system costs 3600 dollars and up, and you don't find it in your average family saloon! Each one is done individually, the first step being the stripping of the interior of the car. Seats, upholstery, side panels and floor covering all comes out so that Miller's men can go to work.

Meanwhile, elsewhere, a woodworking shop starts to build acoustic suspension woofer enclosures which will be mounted between the passenger compartment and the trunk (boot). Amplifier power of 200 watts per channel or more isn't unheard of; and rear-channel digital time delay or other sound enhancement is increasingly common.

A hallmark of these installations — and similar installations being done by experts across the southern United States — is the invisibility of the speakers. An installer in Tucson, Arizona recently showed me a fourteen-speaker installation he'd done in a Cadillac Eldorado. Spotting the two woofers wasn't difficult; a series of perforated holes in the rear deck outlined the speaker cones. The JBL speakers had been mounted on their backs in two specially-built wood enclosures.

'You need the wood for a really musical sound', he explained. By listening, I could tell that a pair of midrange units and large tweeters were mounted in the door panels, but all my eyes could see was the red and white upholstery of the car. The installer explained that he'd removed the door panels, treated the interior cavity with fibreglass and fashioned a baffle out of sheet steel to fit exactly as the door panels had. In it he installed his speakers, then welded the panels in place, covering the whole thing with grille cloth fabric. I discovered another pair of mid ranges in the rear passenger columns, and another pair of midranges in the never did find out where the remaining four speakers (including a pair of 2.5cm (one-inch) dome tweeters) were! I must report that the sound was worthy of the effort.

The electronics of these super-systems — which occasionally approach the cost of the car itself — generally include, in addition to am fm stereo tuner and cassette deck, an amplifier producing 100 watts per channel of sound or more (that's rms), an equalizer/pre-amplifier and some form of rear-channel treatment. A southern California phenomenon only a year or two ago, they've swept across the southern states and are working their way northward to New York and New England.

Interestingly, they come at a time when component retailers blame a recession for a decline in the sale of home audio equipment, at a time when American gasoline consumption is down five per cent and when new car sales — particularly of big luxury models — are at near-depression levels.

More car components

TWO MORE high fidelity component manufacturers — Altec Lansing and Kenwood — have introduced components for the car. The former's AL-1 system consists of a pair of 13.3cm (5¼-inch) extended range speakers, a pair of 7.6cm (3-inch) high-frequency drivers and a self-powered subwoofer, all priced at 350 dollars.

Kenwood's offerings include no less than thirteen car components, including four receiver/cassette units, a variety of graphic equalizers and power amplifiers plus two speaker systems.

Two circuits in the fm section are designed to improve reception — the first by seeking the next available fm signal when the one you've tuned to weakens; the second, a computer-guided reception monitoring system, mutes for five seconds when a signal fades, reactivates to a test signal and if it's still too weak, may be programmed to switch to the tape deck automatically.

Talking to tweeters!

AMONG my acquaintances is an audiophile who talks to his components. He got the idea from articles about helping plants to grow by talking to them, and earnestly believes that by bidding his turntable and tuner good morning, he keeps them out of the repair shop. Crazy? Well, the latest word from Japan is that not only are we all going to start talking to our audio equipment, but it's likely to answer back.

The first manufacturer to announce voice-actuated audio equipment in the US is Toshiba, whose Acoustic Remote Controlled High Fidelity Component System can perform any of 19 different operations. The unit isn't much of a conversationalist. If it decides to do what you ask, it responds with *'okay',* if not, it says *'repeat'.*

A voice analysis unit samples the characteristics of your voice pattern, a match unit converts your command into digital information and a central processing unit, an eight-bit linear processor, transmits the necessary information.

This system truly responds to *'his master's voice';* it recognises only one voice. Technics and other manufacturers showed similar voice-activation systems at the recent Audio Fair in Tokyo.

New super-fi discs

THE catalogues of super-fi record companies continue to swell, even as more traditional labels introduce digital discs of their own. Vox Productions recently recorded the first two of a proposed set of the complete Bruckner Symphonies in London under the baton of Harold Farberman and using the Sony PCM 1500 system.

Meanwhile, M & K RealTime Recordings has completed a set of eight albums of classical favourites (Tchaikovsky, Dvorak, Smetana, etc) with the Philharmonia Hungarica, also using a modified Sony PCM 1500.

Mobile Fidelity, which leases master tapes from major record labels, plans to announce forty new titles this year, including a six-title classical catalogue and a line of super fidelity cassettes. Among the pop artists involved in the company's first 1980 release are The Beatles, Styx, Neil Diamond and Melissa Manchester.

Meanwhile, Sine Qua Non Records of Providence, Rhode Island, which is also in the super-fi record business, released the first commercial cassettes to be duplicated on TDK SA tape while Connoisseur Society has begun duplicating on duPont's new Crolyn II. Both labels specialise in high-fidelity classical recordings.

Three recent SQN cassettes — Digital Hits of 1740 performed by the Cambridge Chamber Orchestra; Renaissance Brass featuring the Empire Brass Quintet and Anthony Newman playing Handel's Fireworks and Water music on the organ — were recorded by Soundstream Inc's digital process.

Superfi get-together

JUST before the Winter Consumer Electronics Show, representatives of some 13 superfi record companies sat down to discuss mutual problems and to explore the possibility of forming their own trade organisation. Stephen Traiman, the new executive secretary of the Recording Industries Association of America, suggested that the superdisc makers might form their own subgroup inside his organisation; and members of the group considered the pros and cons of setting up their own trade association. They failed to reach a conclusion, but agreed to meet again. Among the other topics under discussion: a public relations programme to explain to record buyers how superdiscs differ from the run-of-the-mill product of major labels (and, more importantly, why digital superdiscs cost more than 50 per cent more than digital discs released by conventional labels); a sharing of technical knowledge among labels; possible drawing up of disc standards (it was pointed out that many superdiscs weigh as much as 50 per cent more than the RIAA standards for long-playing records and differ from RIAA specifications in other important respects)

ADRIAN HOPE investigates and comments upon current controversy

HOPE on HI-FI

RUFFLING BUZBY'S FEATHERS!

IF YOU took all the transmitter aerials of taxis, fire brigades and other public services dotted around our large cities and laid them flat on the ground end to end — preferably on high ground — then Britain would at last have decent reception of BBC and commercial radio stations — and there'd be no metallic chat breaking through on to hi-fi playing discs or tapes either.

I wish I could offer some more specific statistics, like how many radio transmitters there are in the North of London — probably the worst area in all England for domestic listening — or what steps officialdom intends to take to improve the situation. But when I spoke to them, the Home Office, which is responsible for licensing every legally operating transmitter, was regrettably "unable to help".

My first encounters with the Post Office, which is responsible for tracking down interference caused by transmitters licensed by the Home Office, were even less rewarding, but much more exhilarating. I was asking for an official comment on the special problem that exists in North London, where aerials transmitting the two-way chat of taxis, firemen, water boardmen, Uncle Tom Cobbleys and all, bristle from innumerable towers, roof-top masts and even church spires.

"We are unable to trace any special problem," was the Post Office spokesman's first considered reply.

"Rubbish", said I. "I have talked off the record to your engineers and I know they're up to their eyes in interference problems created by the Home Office policy of granting a transmitter licence to virtually anyone who asks for one and can afford the annual fee of a few pounds."

"How dare you go sneaking round impersonating a member of the public and talking to our engineers," replied the spokesman huffily. "Because," I snapped back, "I am a member of the public and I am sick to death of hearing taxi drivers chatting over quiet passages of music, in my home and in the home of virtually everyone I know".

Finally, and only by threatening to publish the Post Office spokesman's private telephone number with an invitation that London readers phone him direct with their own special problems, I was rewarded with an official comment which still wakes me smiling every morning.

"By *special* problem," I was told, "we thought you meant *new* problem"

A special problem

Whether or not the Home Office and Post Office know or care, there is indeed a very special problem with breakthrough interference in some areas of London. And in the long term the only real answer will be a rethink on transmitter licensing policy in this country. But in the short term there are some steps that individual sufferers can take. Here then is a survival kit for anyone who resents listening to Charlie Delta One discussing the pick up of an old lady and her dog while trying to get into Brahms or the Boomtown Rats.

Public services need two-way radio communication. No one disputes that. But in the UK a curious situation exists, dating back to those pre-pirate radio days when it was assumed that the Light, Home and Third BBC programmes were all we would ever want to hear. Some of the frequencies on the vhf waveband reserved for entertainment broadcasting were given over to two-way communication. So the BBC and commercial radio stations are now crammed on the radio dial alongside taxis and the like. For a good quality receiver, with a good rooftop aerial located not too close to a powerful transmitter, this should present no problems. The receiver pulls in the wanted station and rejects the unwanted two-way chat. But cheaper receivers may start to pull in unwanted stations as well and even the most expensive receiver is unlikely to cope with a powerful unwanted transmission from a nearby aerial, perhaps on the roof or from the building next door. There is also good evidence that two low power transmitters on the same, or intermodulating, frequencies may cause mysteriously brief, garbled snatches of interference when they clash by briefly operating at the same instant of time. This infuriating breakthrough is especially hard to trace back to source culprits.

Manufacturers are left in a cleft stick. If they build masses of rejection circuitry into a domestic radio receiver, and so make it virtually immune from a blitzkrieg of two-way chat, they will have to charge more for that receiver. This will only be a justifiable expense for users living near a transmitter. In practice every radio receiver manufacturer has his own compromise. Some say "what the hell" and put out a cheap receiver that seems almost to prefer the sound of metropolitan communication to the sound of music. Others go the whole hog and make their receivers immune to most types of breakthrough; but at a price, and in relatively small numbers. Others plump for a compromise, perhaps offering factory modification if problems arise.

48-hour turn round

When Londoners ask me to advise on what amplifier, tuner and so on to buy I often recommend Armstrong. This isn't because their equipment is better or cheaper than anyone else's. It's because their Holloway factory offers a 48-hour turn round on all repairs including modification to cure breakthrough from a blitzing transmitter (free, incidentally, during the guarantee period). To my simple mind, service, like a quick turn round on repairs and the fitting of extra interference rejection components, is far more important than an extra knob, dial or gimmicky sales feature.

But it isn't just radio sets that pick up radio interference breakthrough. A gramophone or tape recorder — in fact any part of a hi-fi system — can serve as a radio receiver if soaked in powerful radio waves from a nearby transmitter. In most cases one of the audio connecting leads, for instance the long cables to the loudspeakers, acts as an aerial; and a faulty joint or even a transistor can act in cat's whisker fashion to "detect" the radio signal and feed it into the audio circuits. The signal is then amplified and reproduced loud and unpleasantly clear from the loudspeakers. For a much fuller explanation of the cause, readers should refer back to two articles by Vivian Capel in the September and October 1978 issues of *Practical Hi-Fi*.

The first move

The sufferers first move is to check all connections and if possible try changing old leads for new. Sometimes (in fact quite frequently) the soldering points in the tiny audio connecting plugs at the ends break away and isolate the screening. Memo — If you want to give someone a really useful Christmas or birthday present give them some spare connecting leads; *not* just another record cleaning gadget which will probably end up in a drawer along with a pile of other unused gadgetry collected over birthday and Christmases past).

If problems persist, call in the Post Office engineers. You do this by visiting your local Post Office and asking for a free pamphlet called *Good Radio and Television Reception*. This contains a "Request for Investigation of Interference" form which you fill in and send to whatever address your local Post Office quotes. Note well, however, that the Post Office is concerned only with tracking down interference caused to radio and tv reception, *not* to disc and tape reproduction.

This may sound daft. In fact it is daft, because radio transmitters have no more right to ruin disc and tape listening pleasure than they have to ruin radio listening pleasure. But until the law is changed the Post Office is required by the Home Office only to look at interference to radio and tv reception. Don't bother to fight this problem, *join it*. Be sure that any complaints you make emphasise whatever interference you suffer on *radio or tv*. Very probably when the Post Office engineers call to look at your radio problems they will end up looking at your disc and tape problems as well, because the two areas are often inextricably linked.

Don't be fobbed off with phone calls by the Post Office engineers. Do insist on a visit. By "sneaking round impersonating a member of the public" as well as asking for anodyne official comments through the press office, I know that the Post Office engineers, especially in some parts of London are overworked, hard pressed and fed up to the back teeth with dealing with interference caused by what they see as reckless over-licensing of two-way transmitters by the Home Office. Currently the Post Office engineers are rather in the position of King Canute against the waves. But they (and MPs, of which more later) are your direct link with the traditionally secretive Home Office who, after years of experience, are well skilled at deflecting complaints from the public.

When the Post Office engineers arrive, do take notice of any positive suggestions they make. For instance, if the engineers criticise your aerial system, then believe and act on what they say. Many domestic aerial systems are very poor and their improvement can eliminate or drastically reduce interference. It may for instance be possible to use a very directional aerial, carefully positioned to pull in the stations you want but reject unwanted garbage. Sometimes engineers will be able to improve your situation by incorporating a couple of simple electronic components in your domestic system. Other times they will refer you back to the manufacturer.

Accept offers of help gratefully and do, if advised, go back to the manufacturer. But if the manufacturer contests the Post Office appraisal of the situation, by arguing your equipment is OK, then don't be scared to drag the Post Office engineers back again with a second complaint.

The last resort

If you end up with a flat admission from the Post Office engineers that nothing more can be done, then there is in fact only one thing that you can do — write to your local MP confirming that you are suffering from an interference problem which the manufacturer of your equipment and the Post Office engineers regard as insoluble. Ask your MP to raise the matter with the Home Office. The chances are that other residents in your area will be suffering similar problems and if only they too can be persuaded to cast off that traditional British disease, apathy, and write a similar letter, then the Home Office will be put in an unenviable situation. The question is, should it continue bowing to the commercial pressures of taxi firms and the like who clamour for more aerials and more transmitter power, or should it bend to political pressure from MPs airing the complaints of constituent sufferers?

In the long term there just might be an accelerated rethink over the present allocation of entertainment frequencies to two-way communication links, perhaps even once-and-for-all banishment of all two-way chat from where it does not belong *ie* alongside BBC and commercial radio. In the short term the Home Office might just come down heavily on whatever transmitter is causing the local problem, perhaps insisting on a reduction in power and modification to the aerial beam direction or even total shut down. The licence granted by the Home Office does in fact require that the transmitter should "not cause any avoidable interferennce".

So if you are a sufferer don't suffer in silence any longer. You have nothing to lose but a little time and effort — and the sound of taxis with your Tchaikovsky.

Vays of making you listen!

NEWS of two lovely ideas for binaural sound comes from the Continent. German radio stations have for several years now been transmitting a number of broadcasts in binaural format and headphone listening is a way of life. Hence, incidentally the success of European headphone manufacturers such as Sennheiser, Beyer, and AKG.

In Berlin they've solved the age old problem of compatibility in elegantly simple fashion. The same concert is transmitted on two different vhf fm wavelengths at one and the same time. If you tune to one frequency you hear the concert from the binaural microphone set-up which is suited to headphone listening; if you tune to the other frequencies you hear the same concert from a conventional microphone mix which is suitable for loudspeaker reproduction. Of course in the UK we couldn't do this because our fm band is so cluttered with policemen, firemen, taxi drivers, Uncle Tom Cobleys and all that there isn't even enough room for all the BBC's output. The sooner these public services are shifted off the limited bandwidth available for vhf fm broadcasting the better for everyone.

LAWS OF THE HI-FI JUNGLE

EVERYONE knows about the laws of Sod and Murphy. These can be relied on to ensure that only the most treasured tapes end up in a tangle, only irreplaceable gramophone records get scratched, refrigerator thermostats only cut in and out with an unsuppressed thump while you are taping a quiet passage and the output transistors of an amplifier only burn out on a Saturday night. But there are all manner of different and less well known laws and corollaries — You can for instance rely on the most expensive component in a circuit to self destruct at the first sign of a risk to its fuse . . .

There's now a book (*The Official Rules* by Paul Dickson, in Arrow Book paper back at £1.25) which gathers together all known rules and corollaries from around the world. They're listed in alphabetical order, under the name of their inventors. And a surprising number will appeal to the audio trade press and public. Here are just a few:

For proud purchasers of new hi-fi equipment: *'When all else fails read the instructions'*. Or: *'Don't force it, get a larger hammer'*. Or: *'Any tool, when dropped, will roll into the least accessible corner'*. Or: *'Trouble strikes in series of threes, but when working around the house the next job after a series of three is not the fourth job — it's the start of a brand new series of three.'*

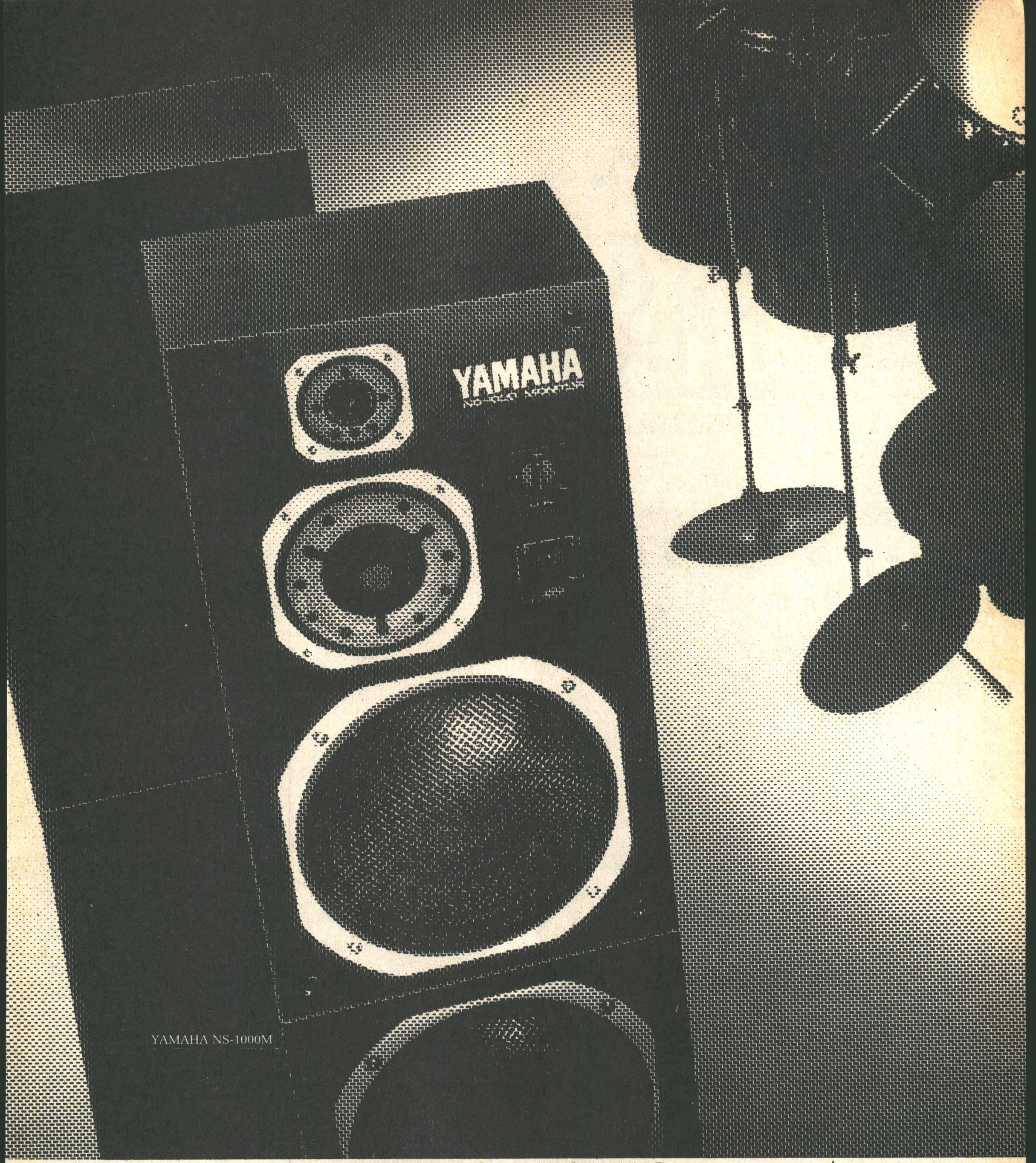
For advertising executives: *'When your client's hopping mad, Put his picture in the ad. If he still should prove refractory, Add a picture of his factory.'*

For the technical press: *'I have yet to see any problem, however complicated, which, when you looked at it the right way, did not become still more complicated.'*

And for a hi-fi journalist trying to squeeze information out of a recalcitrant manufacturer: *'If you have to ask, your'e not entitled to know; and if you don't like the answer, you shouldn't have asked the question.'* There's even one for hi-fi journalists who over-indulge at boozy press conferences: *'It does not matter if you fall down, so long as you pick up something from the floor while you get up.'*

And that selection is taken only from the first of 26 chapters . . .

YAMAHA NS-590



LIKE OUR DRUMS OUR SPEAKERS TAKE SOME BEATING.

And it shows. The fact that making musical instruments over the years has given us a significant edge. Because it's taught us how to develop listening to an art. To be aware of tonal qualities that even sensitive test equipment cannot measure. Musicians and studio engineers alike, understand exactly what we mean.

Our NS-590 series demonstrates yet another important side of the Yamaha character. The ability to invent our own technology. We've done this with beryllium, the lightest and hardest metal known to man. By our unique vacuum production process we've constructed a tweeter with a dome that has the extra depth to produce superb linearity on the highest highs.

At the other end of the scale, our 12" woofer given power and richness to bass notes. While in the area where most of the music is heard, a specially treated midrange cone makes sure of wide dispersion and high response.

Add to this a well tried and tested crossover network and precise level controls and you have a performance that's reflected by the figures. For example, 1 watt will produce 91dB at one metre whilst handling up to 70 watts.

For those who wish to invest in loudspeakers that are used as standard reference, there's our NS-1000 range. They have additional refinements such as a beryllium midrange driver as well as a beryllium tweeter.

Yamaha — highest performance with the lowest distortion is well within our power.

DETAILS OF THE YAMAHA NS-590
AND NS-1000M LOUDSPEAKERS FROM:
NATURAL SOUND SYSTEMS
10 BYRON ROAD, WEALDSTONE,
HARROW, MIDDLESEX HA3 7TL.
TELEPHONE: 01-863 8622.

YAMAHA

We have a good ear for music

VENNAL SAVES YOU MORE

DENON SPECIALS

TU 200 Tuner	£114.35	103 Moving Coil Cart.	£83.95
TU 300 Tuner	£145.30	103S Moving Coil Cart.	£92.83
DP 30L DD Turntable	£146.95	103D Moving Coil Cart.	£139.50
DP 40FL DD Turntable	£239.95	PMA 400 Amplifier	£149.96

AMPLIFIERS

Aiwa (Range)	I.N.
A & R Cambridge	☎
Aurex	☎
Black Tulip	☎
Meridian 101/103	£390.00
N.A.D. 3020	£86.00
N.A.D. 3030	£99.00
Quad 33/303/44/405	☎
Rogers A75 S2	£201.85
Sugden A48 S2	£227.50
Technics (Full Range)	I.N.
Trio (Full Range)	I.N.
Toshiba (Full Range)	I.N

RECEIVERS

Aiwa (Range)	I.N.
N.A.D. 7030	£149.00
Tandberg (Range)	☎
Technics (Full Range)	I.N.
Trio (Full Range)	I.N.

TUNERS

Aiwa (Range)	I.N.
Aurex (Range)	☎
Black Tulip	☎
Meridian 104	£225.00
N.A.D. 4030	£99.00
N.A.D. 4020	£86.00
Quad FM/3	☎
Rogers T75 S2	£139.75
Sugden T48	£134.55
Technics (Full Range)	I.N.
Trio (Full Range)	I.N.
Toshiba (Full Range)	I.N.

CASSETTE DECKS

Aiwa (Full Range)	I.N.
Aurex	☎
Black Tulip	☎
N.A.D. 6020	£89.00
Technics (Full Range)	I.N.
Trio (Full Range)	I.N.
Toshiba (Full Range)	I.N.

SPEAKERS (Per Pair)

Aiwa AS3	V.I.P.
Acoustic Research (Full Range)	I.N.
Bower & Wilkins (Full Range)	☎
Infinity (Full Range)	☎
K.E.F. (Full Range)	☎
Mordaunt Short (Full Range)	☎
Quad Electrostatics	☎
Rogers (Full Range)	☎
Tangent SPL 1	£79.95
Tangent Monitor TM3	£129.95

RECORD DECKS

Aiwa (Full Range)	I.N.
Ariston RD 11S	£258.00
Black Tulip	☎
N.A.D. 5080	£89.95
Technics (Full Range)	I.N.
Trio (Full Range)	I.N.
Toshiba (Full Range)	I.N.

☎ PRICES ON APPLICATION **IN** – INTELLIGENT NEGOTIATION
VIP VENNAL INTRODUCTORY PRICE

FREE DELIVERY

Yes, anywhere within the UK mainland on all orders over £50. Orders under £50, a £4 delivery charge will be added. (Prices on application for delivery outwith the mainland)

ACTIONLINE 0563 34826

Phone Jim Young for current prices, intelligent negotiation where applicable. And phone in orders (credit card holders only)

CREDIT FACILITIES

For goods over £125 with a minimum deposit of 20% the balance payable over up to 30 months. Please enclose a cheque for the deposit with your order.

Export orders invited.

Prices correct on going to press and inclusive of VAT at current rate.

2 YEAR guarantee on all merchandise except Cartridges and Styli.

VENNAL AUDIO

VENNAL AUDIO, THE FOREGATE,
KILMARNOCK, SCOTLAND.

TO VENNAL AUDIO, FREEPOST, KILMARNOCK. KA1 1BR

☐ P.O. ☐ CHEQUE ☐ CREDIT APPLICATION
☐ ACCESS ☐ BARCLAYCARD (encs.cheque)

Credit Card no. here

Signature

Item

Price

Name ____________

Address ____________

CLOSED ALL DAY WEDNESDAY. Tel. ____________

VIDEOTONE SPECIAL OFFER

NEW GB2 FOR OLD MINIMAX II

Videotone, always pioneers of the new idea, have now thought of the most helpful one yet. Over the last seven years we have had many hundreds of thousands of delighted Minimax 11 customers. We now believe that many of these are ready to upgrade but would be reluctant just to dump their Minimax's. Well, here is our helpful offer.

Send or bring us your existing Minimax 11 and we will allow you £15 against a brand new pair of our fabulous GB2 Speakers developed from the Minimax.

If you send your speakers back please ensure that they are well packed to avoid cabinet damage, and include £5 for post and packing.

Normal GB2 Price £89.

Videotone DIRECT GB2 Price £60 + £5 Post & Packing

GB2 TRADE-IN

£45 + £5 Post & Packing

Send for your list of local stockists.

VIDEOTONE

**98 CROFTON PARK ROAD,
CROFTON PARK, LONDON SE4.
Tel: 01-690 8511/2**

OPEN 9am–5.30pm MON to SAT

Probably the most sophisticated audio equipment available.

audio pro

Audio Pro (hi-fi) Ltd.,
Brook House, Crewe Road, Wheelock, Sandbach, Cheshire.
Telephone Sandbach (09367) 7520 Telex 36492.

HI-FI RECORD & TAPE GUIDE

Reviewers this month

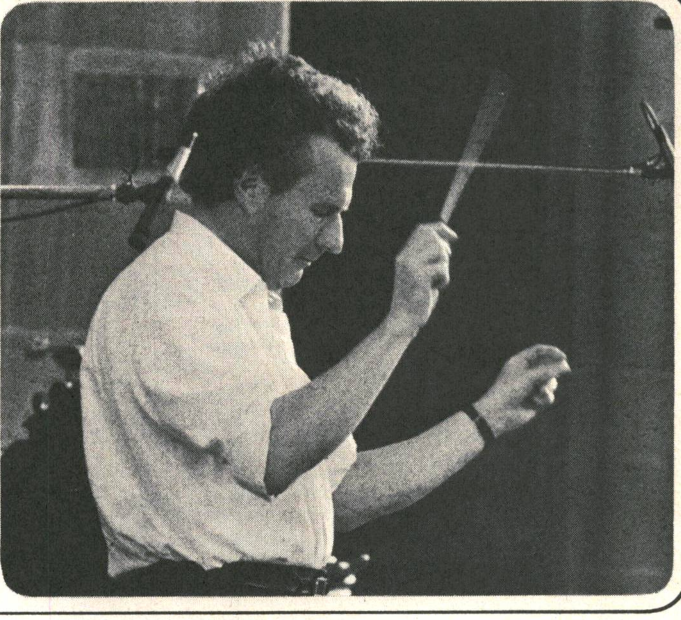
CARL ANTHONY
ROBERT DEARLING
ARTHUR ORD-HUME

NOTES

ALL records and tapes reviewed may be assumed to be 30.5cm (12-inch) stereo LPs or normal format Dolby processed cassettes unless otherwise stated. Quadraphonic records are indicated by the suffix (4) and the quadraphonic systems employed (CD4, QS, SQ, or UD4). Cassettes are identified by the symbol (C) and budget-price issues by the symbol (B). Prices and/or distributors. All prices were correct at the time of going to press. Readers are advised alwas to examine records before purchase as surface quality does vary, and our review sample may not necessarily be representative.

EQUIPMENT USED

A WIDE variety of reproduction equipment is employed for these reviews and includes KEF, Spendor, Dahlquist, Wharfedale, Radford and Linn Isobarik loudspeakers, as well as staff-designed enclosures. Lux, Quad, Radford and Sirac valve amplifiers. Lecson, Naim and Quad transistor amplifiers; Ariston, Garrard, Linn Sondek, STD, Thorens, and Transcriptors turntables, Grace, G. F. Hadcock, SME, Thorens, and Transcriptors pickup arms. Audio-Technica, Coral, Decca, Denon, Entre 1, Onlife, Ortofon, Shure and Supex phono cartridges. We shall also be regularly employing other equipment received for review.



Colin Davis' interpretation of Verdi's Un Ballo in Maschera *is reviewed this month — in the best tradition of the 'musical curate's egg' according to A O-H.*

RAVEL
Bolero; Mother Goose Suite; *La Valse*
London Symphony Orchestra
Conductor — Pierre Monteux
Philips Festivo 6570 092 — £3.25

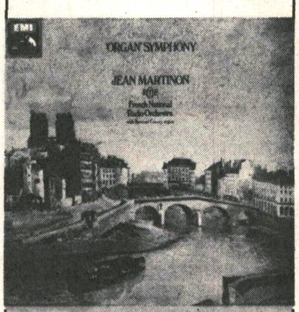
PIERRE Monteux and Maurice Ravel were born in the same year — 1875 — and the conductor was noted for his superb realisations of French ballet music. This is one of his last recordings, made shortly before his death in 1964 while he was chief conductor of the LSO. Its documentary value, however, is outweighed by the immense authority Monteux brings to two of these scores and the understanding with which he treats that over-rated *Bolero*, allowing it to unfold but not to take too long about it. In fact, it is even pushed along in one place a little awkwardly. Perhaps a tape join was responsible.

Mother Goose came into being originally in 1908 as a piano duet for performance by the children of Ravel's friends the Godebskis. Later the composer orchestrated the music for a ballet. It is difficult to imagine children appreciating the scenes and characters in the music without some visual aid — or the composer standing behind the piano stools to point out the various entrances and activities. *'Here* is Beauty; *there* is the Beast . . . *this* is the Little Flea leaping . . .' and at an oriental phrase: *'Here* the Princess of the Pagodas.'

La Valse is a picture of the waltz city, Vienna, seen through the prismatic mirror of a master impressionist. Tantalising snippets of waltz melodies drift against a backdrop of a basic 3/4 rhythm, the whole giving, I feel, a disturbing parody of the world of Johan Strauss.

The 17-year-old recording wears its age well, but there is an occasional 'tizziness' in the violins and the orchestral sound thickens uncomfortably towards the end of *Bolero* after a beautifully clear start. Some of the percussion effects are extremely well caught, as are the horn *glissandi* in *Bolero* and the double bassoon motifs in *Mother Goose*, but one must make allowances for some rather obvious electronic spotlighting. *Mother Goose* occupies the end of side one and the beginning of side two: what a pity continuity could not have been maintained by putting it complete on one side with the two shorter works together on the other. The timing would have allowed it.

RD



SAINT-SAENS
Symphony No3 in C minor Op78
'Organ Symphony'
Bernard Gavoty — *organ*
French National Radio Orchestra
Conductor — Jean Martinon
EMI HMV ASD3674 — £5.40

RECENTLY I reviewed Eugene Ormandy's recording of Saint-Saen's so-called *'Organ Symphony'*, now available on a good mid-price CBS Classics record, finding it a thoroughly acceptable offering, but since the recording itself dates from eighteen years ago I remarked that a more modern recording, although more expensive, would be more rewarding. I recommended Barenboim's interpretation with the Chicago Symphony Orchestra on DG 2530 619.

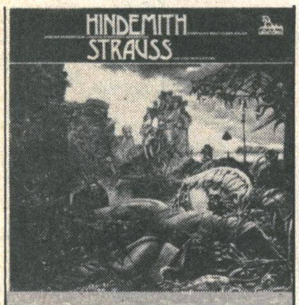
Now comes Jean Martinon's full price issue. On the whole I abide by my Barenboim recommendation because his recording and pressings are a degree or two better than this HMV disc, but there is a lot to be said for having French music played by a French orchestra and conductor. Barenboim's smoothness is replaced by Martinon's excitement, qualities abetted by the respective sound characteristics of DG's and HMV's recordings. Martinon receives a good open acoustic, admirably clear and natural, with good instrumental positioning. I suspect that some slider-riding has taken place in the studio but if so it is tastefully done, with musical rather than hi-fi requirements clearly in mind. Oddly, the instruments which set this work apart from most 19th century symphonies, the organ and two pianos, are not unduly forwardly balanced. In the case of the pianos this means that they tend to swirl around in a kind of aural tunnel a long way back, but the organ gains from a modest balance because its pedal notes in the slow section do not affect the upper woodwind lines with a sympathetic beat, as they do on Ormandy's disc. At the end, however, organ joins splendid hard-toned timpani and incisive brass to drive home the exciting climax.

I find Martinon's direction wholly admirable throughout the work, and his affecting moulding of the slow section is amongst the most sensitive I have heard. The orchestra, too, rises excellently to Saint-Saen's intricate score; only occasionally is one reminded that the French National Radio Orchestra was, not so long ago, one of the most offensively 'French-toned' of all French orchestras as well as being a long way below first class as a group and as individual instrumentalists. The bassoons' rather saxophony tone survives, but the rest of the woodwind and the brass seem to have lost most of the harshness of yore.

There remains enough Gallic fire to make this recording in some ways even more recommendable than Barenboim's, but the latter conductor brings the work firmly into the international arena and continues to be — just — my first choice.

RD

Classical



R. STRAUSS
Death and Transfiguration — tone poem Op24
HINDEMITH
Symphony *'Mathis der Maler'*
London Symphony Orchestra
Conductor — Jascha Horenstein
Unicorn RHS312 — £5.20

AN old artist lies on his deathbed struggling for breath. As he drifts in and out of consciousness his memories of youthful hopes, desires and ideals are tormented by pain and fever and he feels intense frustration in the realisation that his ideals are unattainable on Earth. His soul is at last released, and he finds the realisation of his ideals in Eternity.

This is the programme, stark and explicit, of Strauss's *Death and Transfiguration,* and it typifies the composer's powerful youthful romanticism — he was twenty-five when he wrote it in 1889 — a romanticism that coloured his whole creative life. It is the sort of 'programme' Carl Nielsen might have adopted, but in his case there would have been no personal element in the music: rather, a struggle and final resolution between conflicting elements or concepts or keys. In fact, the two composers stood at opposite idealistic poles, each seeking ultimate victory through musical conflict.

If Strauss relies heavily on a pictorial image in *Death and Transfiguration,* Hindemith goes a stage further: his opera *Mathis der Maler ('Mathias the Painter')* explored the life and aims of the 16th century painter Mathias Grunewald. It was at the time of its composition (1934) an oblique criticism of Naziam just at the time the Nazis wanted to enroll Hindemith as a kind of official Party composer. The opera was promptly banned, and the composer responded by reshaping three sections of it to form an orchestral symphony based on three panels of Grunewald's famous altarpiece at Isenheim: Angelic Concert; Entombment; and The Temptation of Saint Anthony.

In the first movement the angels are heard to chant various German sacred songs in joyful mood, while the second conveys in subdued tones the conquering finality of the tomb. Longest and most complex is the finale, in which the incorruptible soul of St Anthony finally emerges victorious over all demonic temptations. It is this final movement that is paralleled in Max Ernst's chilling painting reproduced on the front of Unicorn's sleeve, and while its is regrettable that Grunewald himself is not thus represented, I find the reproduction of this extraordinary painting most valuable in reflecting the chracter of the disc as a whole. As an artistic conception it has a greater power than even Hindemith's finale. Unicorn sleeve designs are rarely less than first class but this one is supremely well chosen.

Jascha Horenstein died in 1973 at a time when his recordings were revealing his immense power fully perhaps for the first time in his long career. His grasp of these scores is remarkably sure, his moulding of climaxes effective, and his orchestra control unsurpassed. Hindemith's music refuses to allow any suspicion to allow maudling sentiment to take over strauss's tone poem. At the same time nothing is played down. In short, these are clear, honest interpretations that let the music speak for itself and as such are immensely welcome.

Fortunately the recording is of excellent depth and clarity, containing the shatteringly triumphant chords at the end of Hindemith's Symphony with ease and sketching in the intricate details of the first movement with perfect clarity. The darker scoring of Richard Strauss is also given a translucent sound that is very natural and pleasing, and the surfaces are perfect. The only flies in the ointment are a number of errors in the sleevenote. *RD*

W A MOZART
String Quartets: K155 in D; K156 in G; K157 in C; K158 in F
Dimov Quartet
United Artists Cadenza
UACL10008 — £2.99

KNOWN as *'Milanese Quartets'*, the six works K155-160 were composed in that city during the winter of 1772/3 (or in the case of K155, during the journey there from Salzburg), around Mozart's 17th birthday. They show a considerable advance in breadth and freedom over the four earlier Quartets (on Cadenza UACL10007), being full of charm and sunlit gaiety and as yet untouched by the stark drama and tragedy to be found in the quartets of Haydn at this period.

I regret that the Dimov Quartet in the first four of these Milanese Quartets, although technically proficient at getting the notes right, skates over the surface, reducing the value of the music quite drastically. Take for instance the *Adagio* of K156. Mozart called for no less than six alternations between *piano* and *forte* in the first two bars, a fact that would never be guessed from this uneventful performance. One would have thought that Mozart's exceptional use of E minor would have given the players some clue that extra care should be taken over the composer's instructions. It is impossible to overstress such contrasts as these in this music: *ppp* to *fff* would certainly be acceptable. In addition there is a niggardly approach to repeats throughout the four works and some spurious, not to say tasteless, phrasing in the finale of K155.

The recording has characteristics similar to those of the companion disc: clean, unspectacular sound lacking, like the performances, a true realisation of the value of dynamic contrast; in addition I note that the inner sleeve of 10007 is a quality polythene bag while 1008 is wrapped in a cheap paper envelope. The latter type encourages dust damage and should go out of use forthwith. *RD*

HANDEL
Organ Concertos
George Malcolm — *organ*
The Academy of St. Martin-in-the-Fields
Director — Neville Marriner
Argo ZRG888 — £5.25

THE ever-popular organ concerti by Handel keep re-appearing on discs in never-ending combination of players, instruments and works. This new Decca release gives us the opus 4, number 2 in B flat major, the opus 4, number 4 in F major (both played on the Walker/Clutton at Merton College, Oxford), the opus 7, number 4 (on the Byfield at St Mary Rotherhithe) and the number 13 from the second set in F Major on the Walker three-decker at St John the Evangelist, Islington.

George Malcolm gives the expected well-studied interpretations of these fine pieces and really follows Handel's invitations to the full where there appears that score indication which can make or break a soloist — ad libitum. Malcolm's imagination proves to be evoked by the contemporary idiom and I like the manner in which he embellishes and improvises.

Neville Marriner's accompaniment is bright and sensitive but occasionally (as in the F major *Allegro*, for example) seem just a shade too polished.

The big problem with these works is choosing the right instrument or instruments upon which to play them and without much doubt only one of the mounts selected is by not too much of an imagination-stretch 'Handelean' and that is the St. Mary Rotherhithe mutant. Built originally in 1764 by John Byfield it has had a number of rebuilds starting with 1800 and finishing with the Mander restoration of 1960.

The Merton College organ was the work of J. W. Walker and is constructed along 'the classical lines' to a specification drawn up by Cecil Clutton and this at least carries with it a tonal structure which should not have had been too much of a shock to Handel. But Walker's Islington instrument is at best described as an interesting alternative. George Malcolm shows off some of the colours of this unmistakably fine, if rather thick-toned organ which includes such registers as a 4ft Nason Flute and two-rank Terian on the Great, Wald Flute, Nazard and Zink on the Swell, three-rank Scharf on the Positive, Nachthorn, Bombarde and Schalmei on the Pedal — and electro-pneumatic, non-Handelean action.

Mind you, authenticity can be taken too far and, in the final analysis, it is the sound which really matters. And this is a disc of good sound and George Malcolm is too good an artist to fall for the organ overkill treatment and gives us a perfectly acceptable sound — listen, for example, to the opening of the F major opus 4 number 4 which is finely drawn indeed. Recommended. *A O-H*

RICHARD WAGNER · OVERTURES & PRELUDES
VIENNA PHILHARMONIC · KARL BÖHM

WAGNER
Overtures and Preludes: *Rienzi; Tahnhauswer; The Mastersingers; Parsifal*
Vienna Philharmonic Orchestra
Conductor — Karl Bohm
DG 2531 214 — £5.06

RECORD collectors for whom this assemblage of four Wagner overtures and preludes represents just the coupling they are looking for are entitled to feel that they have won the pools, for this is the only available disc offering this precise permutation. For others, of course, one or more of the works will be duplicated, but I venture to suggest that the duplication will be justified by the splendid quality of his new record.

I doubt whether anyone will find my opinion of the music of any interest (in common with most of Wagner's music, the overtures seem to me unbearably pretentious, and *Rienzi* must be one of the coarsest pieces ever written by a great composer) but Bohm's performances would surely survive the sour-faced criticism of even the most committed anti-Wagnerite. Seeking out the strengths of the Vienna Phil, particularly its stirring brass sound and the beautifully integrated string section, Bohm puts them to work to produce some of the richest and most exciting Wagner playing I have heard. For a moment in *Tannhauser* the violins sound a little dry in their emphatic centra section, and there are times when the recording is close enough to catch wind players' intakes of breath, but these are tiny blemishes — hardly that even — in a most successfully produced record.

Wagner apparently never envisaged the use of his *The Mastersingers* overture as a concert piece for he omitted to provide a satisfactory ending: the music articulates with the opening scene. To make a harmonically correct, if rather abrupt, close, the final chords of the opera itself are tacked onto the Overture so that the whole drama, having been duly heralded, is bypassed in an instant in a curious time-warp effect. Wagner did not hesitate to write a new ending for Gluck's masterly Overture to *Iphigenia in Aulis;* perhaps someone might render the same service to *The Mastersingers* overture. *RD*

HÄNDEL·JEPHTHA
Elizabeth Gale · Glenys Linos · Gabriele Sima
Werner Hollweg · Paul Esswood · Thomas Thomaschke
Arnold-Schönberg-Chor · Mozart-Sängerknaben
Concentus musicus Wien
Nikolaus Harnoncourt

HANDEL
Jephtha — oratorio
Soloists — Elizabeth Gale; Glenys Linos; Gabriele Sima; Werner Hollweg; Paul Esswood; Thomas Thomaschke
Arnold-Schonberg Choir
Director Erwin Ortner
Mozart-Sangerknaben
Conductor — Erich Schwarzbauer
Concentus Musicus Wien
Director — Nikolaus Harnoncourt
Telefunken Das Alte Werk
6.35499 — £22.00 (four records)

THE Old Testament story of Jephtha was first used as the libretto for an oratorio by Giacomo Carissimi in the middle of the 17th century. His work *Jepthe* is preserved in Paris.

Handel's health was already failing when, in January of 1751, he began work on what was to be his last oratorio. He knew of Carissimi's setting of Jephtha and decided to set the same story. His librettist Thomas Morell prepared a version of the story which, while including some marked variations from the story in the Book of Judges, was generally transformed into what he believed to be a more popularly acceptable version.

During the composition of the music, Handel developed cataract of the left eye and, by the time it was completed in the early part of 1752, the 67-year-old composer was blind in one eye and his remaining vision was rapidly worsening. And so, twelve years after *Messiah*, *Jephtha* (which, by the way, Handel spelled in his own hand as 'Jeptha') was performed for the first time.

The work followed the disappointing reception given to the oratorio *Theodora* and it is known that this partial failure pained Handel considerably. But Handel was now an old man and his music, if anything, became even more introspective. In *Jephtha* we have a strange work which is filled with the Handel we know and love from the early days of *Acis*, through *Rodelinda*, *Alcina*, *Israel in Egypt* and on through *Samson* and *Judas*. One could say, uncharitably, that it was the same old tunes re-hashed, and the snide joke about Vivaldi having written one concerto 400 times comes to mind.

True this not an earth-shattering work and one is left with the vision of an old man trying hard to re-capture his past successes. At a superficial level this could be so, but *Jephtha* has the distinction of being a very different concept from any other of Handel's writings. And while Morell's libretto is occasionally stultifyingly boring, Handel's music always manages to elevate the words, however meaningless, to a splendour which must have made Morell feel head and shoulders above where he would have been had his words been no more than an abysmally long recitative.

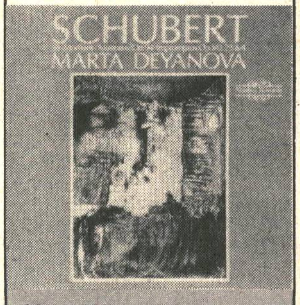
The Act III transformation from despair and anguish into vivid visions of the Life Beyond shows the great Handel at his superlative best and follows the closing chorus of Act II which is the keystone to the whole work. This is a superb development of a theme expressed in four sections.

Werner Hollweg sings the title role with fine voice and clear intonation — the whole is, by the way, in English. Thomas Thomaschke is Zebul, Glenys Linos sings the role of Storge, Iphis is Elizabeth Gale, Hamor is Paul Esswood and Gabriele Sima takes the part of Engel.

The Vienna Concentus Musicus plays on largely contemporary instruments — there is a complete catalogue of the makers and their dates. Nikolaus Harnoncourt takes this pioneering reading with considerable authority and overall succeeds admirably in directing the musical resources of this work — there are, for example, two choirs used.

Accepting that this is not one of Handel's greatest works although it was obviously intended to be just that, this is a valuable addition to the catalogue and for all lovers of *Messiah* and all that went before — and came after — I can recommend this set.

A O-H



SCHUBERT
Moments Musicaux D780
Impromptus D935, Nos 2, 3, 4
Marta Deyanova — *piano*
Nimbus 2115 — £4.85 ④ QS

SCHUBERT was the most rapid composer of all time. Telemann wrote more but he had about fifty years of working life, and Mozart wrote about the same amount as Schubert but, in just over thirty years, he had a longer working life than Schubert. Author of operas, symphonies, string quartets, sonatas and almost countless songs among many other pieces, Schubert produced over 1,000 works in just eighteen years, five months, and although a number were left unfinished, his achievement stands unbeaten.

Important in his output is the piano music since it has an emotional quality that was at that time (Schubert died in 1828) quite new. Taking the keyboard works of Mozart as a starting point and those of Beethoven as an enriching source of technical inspiration, Schubert seemed to treat the piano as an intimate friend to whom he entrusted his deepest and most private secrets. Chopin, Schumann, Liszt and Debussy were to do the same much later but Schubert did it first. There are very many meditative, introverted, whispered creations amongst his piano pieces but relatively few boisterous, humourous, virtuoso ones, and it is in this respect that he differs so fundamentally from Beethoven.

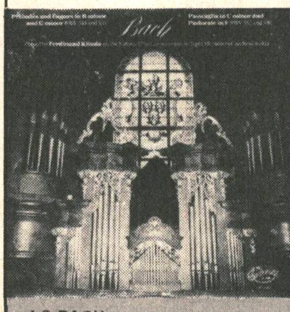
The Six *Moments Musicaux*, D780, were composed between 1823 and early 1828, and when Schubert's publishers came to put them out the character of the works was so different from anything else on the market that they did not know what to call them. They finally issued them under the fractured French collective title *Moment Musicals* with the opus number 94, although Nos 3 and 6 had been issued some years earlier under different titles, respectively: *Air Russe* and *Plaints d'un Troubadour*.

I feel that Miss Deyanova's approach to all the works is a little cool and detached, her tempi in Nos 1 and 4 being too fast so that the former loses rhythmic poinse and the latter tends to gabble.

Similarly, the fourth *Impromptu* of D935 is played too fast for the marked *Allegro Scherzando*, its humorous point being lost thereby. This set of four *Impromptus* forms a cognent key cycle of F minor-A flat-B flat-F minor, and Schumann among others thought of it as a sonata. It is a pity, therefore, that Deyanova has not included the 'first movement'; there are enough unfinished Schubert works without us having to encounter an unbegun one.

The recording is somewhat dark, plumby and indistinct in the lower register, and oppressive at and above *forte*. The effect is of a grand piano (quite the wrong instrument for Schubert's piano music anyway) being played in a room with a low ceiling, and the result is a little tiring. A note on the sleeve tells us that this quadraphonic recording should be treated *'with the same care* (as would be) aplied to any stereo record'. Well, for a start the inner paper sleeve is totally inadequate, there being no agent softer than the disc to absorb the effect of grit, and if the disc interests you, make sure to check its surface minutely before purchase, as out review copy had some surface blemishes.

RD



J S BACH
Organ recital
Ferninand Klinda — *organ*
United Artists UACL 0014 — £2.99

THE monastery at Tepla near Karlove Vary in what is today Czechoslovakia is itself an outstanding architectural treasure. But what it contains is even more of a treasure to the musicologist. The monastery was built in the period 1193-1232 and is in Romanesque-Gothic style. However, the interior was devastated by two fires in the middle of the 18th century. As part of the rebuild, Bohemia's leading organ-builder Antonin Gartner (1721-1791) was commissioned to build two organs in the ruling Baroque style.

The first of these, a three-manual organ, was built between 1754 and 1756 and remained virtually unaltered until at the beginning of this century the short pedal octave was completed and the temperament adjusted to modern tuning. This is the largest and only surviving three-decker work of the Tachov builder, Gartner. Incidentally, the sleeve notes of this record, made under licence from the Czech label Opus, persists in spelling the name of the builder as 'Garner' which is not correct.

Gartner's organ, sympathetically rebuilt in 1960, is substantially the same tonally as it was when its maker completed it. Its main features are the superb bright tone achieved by low pressure pipework of outstanding craftsmanship. The mixtures in particular have a magnificently transparent sound.

In appearance this is one of Bohemia's most spectacular and historic instruments and all the show pipework has applique decoration. The case is breathtaking to behold.

On this disc Ferdinand Klinda plays the Prelude & Fugue in B minor (BWV 544), the one in G minor (BWV 535), the Passacaglia in C minor (BWV 582) and the Pastorale in F (BWV 590). This last is given a superlative performance and the result is a truly ethereal, magical sound which for me captures the majesty and humbleness of this valuable organ.

I am not too wild about the stereo image on this disc: the whole thing is a bit central with a suppressed acoustic (not necessarily a bad thing). Nevertheless this disc just has to be in the collection of every organ lover (a) for the preservation of the sound of Gartner's masterpiece, and (b) for the fine sound of the Pastorale in F. Buy this record — and a felt-tipped pen to alter the mis-spelled attribution. It is rather like talking about Sir Christopher Ren . . .

A O-H

VERDI
Un Ballo in Maschera (A Masked Ball)
Soloists include Montserrat Caballe; Jose Carreras
Orchestra and Chorus of the Royal Opera House, Covent Garden
Conductor — Colin Davis
Philips 6769 020 — £12.79 (three records)

VERDI's *'Masked Ball'* was something of a transitional work. Written when the composer was forty-six years old, it followed *Simon Boccanegra* which had been greeted with a coolness which naturally disturbed him. It was six years since the successes of *La Traviata* and *Il Trovatore* and three years before *La Forza del Destino*.

The return to the classical proportions of the earlier successes is thus understandable and in *The Masked Ball* Verdi strove most successfully to recreate the formula which had worked so well before and which was to work again, in modified form, for *Don Carlos* and, twenty years later, for *Otello*.

The libretto is a little on the solid side and the whole tone of it is *plus-serea*. Indeed, it was at one time acclaimed as Verdi's worst opera although Bernard Shaw considered it to be the opposite. As it is, even today the work is greeted with mixed feelings.

All this is a great pity for, although the opera devolves around the unlikely but perfectly true story of the King of Sweden, Gustav the Third, being killed at a masked ball, the work is filled with fine and melodious music in the best tradition of Verdi.

Students of Verdi will appreciate the position of this opera in the gamut of the composer's works for this work was the first to break with the two-movement aria form (although Verdi returned to it in *The Force of Destiny*) and the cavatinas of both Riccardo and Renato combine the form of a cantabile with the movement of a cabaletta. Another break with tradition is that both Amelia's arias begin and end in the minor key.

One of the most evocative of all the love duets ever written in any Verdi opera is contained in *Un Ballo* and this is indeed one of the highlights of this fine work.

This performance is superlatively contrived by one of the most experienced teams of soloists. The standard of singing is very well balanced and all sing well, often superbly. Montserrat Caballe's voice, though, tends to harden at the top end of her register.

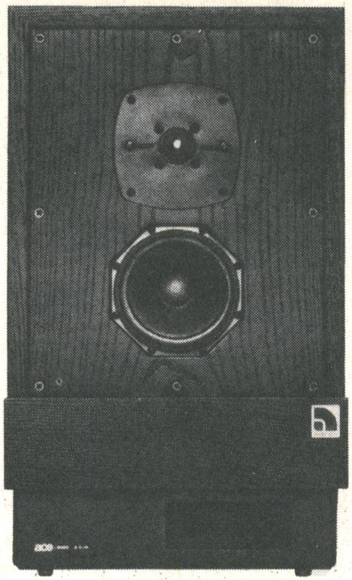
Having said all that, I am left with the feeling that, fine though this performance is, it does not quite come off and it took me many listenings to pin-point the problem as I see it. The parts are sung without sufficient attention to the acting and consequent intonation of the parts.

Colin Davis's reading extracts from the score the maximum possible and the Philips recording combines to make this a superlative musical experience. However, I do get the impression that Davis loses some of the thread of the music in the slower passages and there is occasionally a loss of continuity.

In a work of this length and complexity, these are, though, fairly minor points. What matters is the quality of the music and the singing overall and on this aspect the new set scores quite highly. Of the three other versions in the catalogue (Leinsdorf on RCA Victor, Muti on HMV, and Bartoletti on Decca). I prefer the sound of the soloists in this new set, but prefer the total ambience of the RCA set with Leontyne Price and Carlo Bergonzi.

All in all, here is a good set in the best tradition of the musical curate's egg. You will not be disappointed.

A O-H



AUDIO PRO A4-14 BIAMPLIFIED LOUDSPEAKER.

The only bookshelf-size* speaker with a built-in subwoofer.

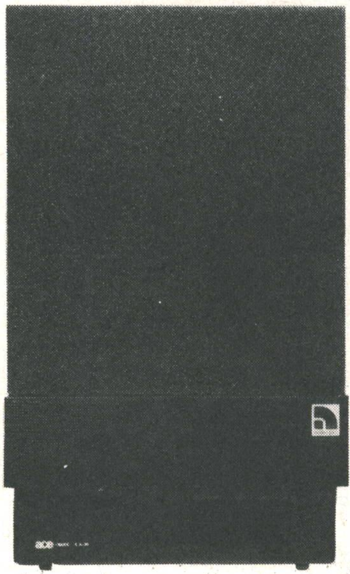
Audiophiles tell us the ultimate speaker system uses biamplification and subwoofers. The biamplified A4-14's, with their built-in "ACE BASS" subwoofers are an entire audiophile system in bookshelf-size enclosures.

Acoustical engineers tell us that the ideal loudspeaker would be a single radiating point. Because of its built-in subwoofer, the Audio Pro A4-14 comes closer to this ideal than any other full range loudspeaker—without sacrificing bass.

Designers tell us that speakers should be heard and not seen. Due to their compact size and full complement of room balancing controls, the A4-14's can deliver their optimum performance—wherever they are placed.

Sound, science, and style. The total design approach to audio.

*Optional floor stands available.



For more information
please write to:
Audio Pro Hi-Fi Ltd.
Brook House
Crewe Road, Wheelock
Sandbach, Cheshire
CW11 9HT
Great Britain

audio pro

Totally Biased — Obviously

2 Feb '80 T. S. Fowler

London N9 7AB

2 February 1980

Dear Howard Popeck,

About 4 weeks ago, I purchased from you a pair of loudspeakers —Swallow RM200's and I can only reiterate what you told me when I first enquired about the RM200's, super, fantastic, incredible.

Having heard the RM200's in comparison with a well known speaker costing well over £1000·00 you would have had a hard job to convince me to part with another £600·00 supposing of course that I had that amount of money in the first instance.

You may remember when you delivered the loudspeakers you had been delayed somewhat that night and did not reach my place until late so I was unable to have a chat with the designer of the speakers (he did put the wheels on the trolley stands though—THANKS). Would you give him my humble thanks for such an excellent speaker and at a very reasonable price.

I would also like to thank you Howard for your excellent and courteous service, thanks again.

Yours,

T. S. Fowler

This unsolicited letter is available for inspection—however, more to the point, the speakers are available for demonstration in our 2 private listening lounges, but strictly by appointment. Our motivation is the love of listening—not the pursuance of blind profit.

Us? Well, I'm Mike Stephenson, the designer of all Swallow speakers.

Me? I'm Howard Popeck—founder and proprietor of Subjective Audio.

Mr. Stephenson at:

SA SUBJECTIVE AUDIO NORTH
HI-FI CONSULTANTS

The Old School,
St. Ann's Lane,
Godmanchester,
Nr. Huntingdon,
Cambridgeshire.
Telephone: 0480 59910

Mr. Popeck at:

SA SUBJECTIVE AUDIO
HI-FI CONSULTANTS

59 Grovelands Road,
Palmers Green,
London N.13,
England.
Telephone: 01-886 7289

"It is not often that one tests a product which cannot be improved either in mechanical design or technical performance yet, at its modest price this unit out performs any preamplifier I know."

GRAMOPHONE

"Not only does the Hafler DH-101 perform electrically in an ideal manner, but it has the precise, smooth mechanical 'feel' that we usually associate with the most expensive audio products."

STEREO REVIEW

"Either in factory wired or kit form the Hafler preamp represents a true sonic bargain."

POPULAR ELECTRONICS

"Certainly, our listening tests do indicate that the DH101 is one of the best available."

POPULAR HI-FI

"A few wires are connected between the boards (the printed circuit switches are already presoldered to circuit boards) and voila! you have one of the finest sounding preamplifiers in the world today."

THE ABSOLUTE SOUND

"Actually, there are very few preamps in the Hafler's price class that even come close. As a matter of fact, there are few preamps at any price that can easily meet or surpass the sonic performance of this unpretentious little preamplifier."

AUDIO HORIZONS

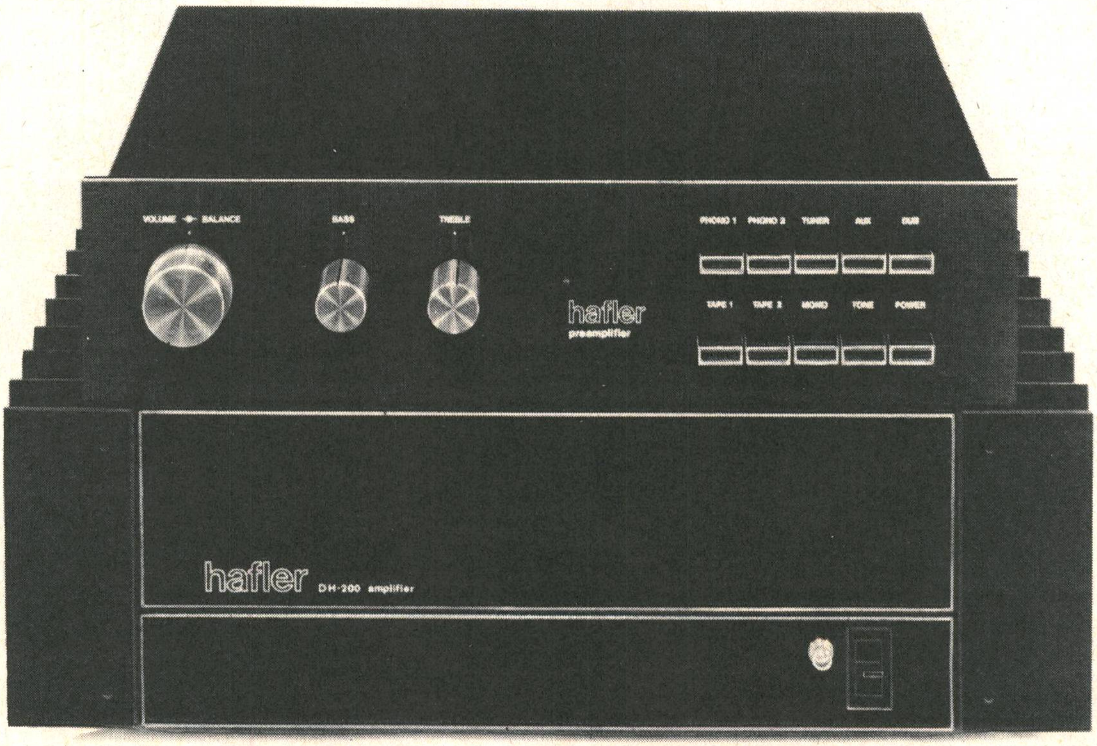
"Its performance is literally 'state of the art'."

AUDIO TEST REPORTS

"Many of the measurable parameters are as good or better than presently available measuring apparatus."

HI-FI NEWS

The Hafler Amplification System



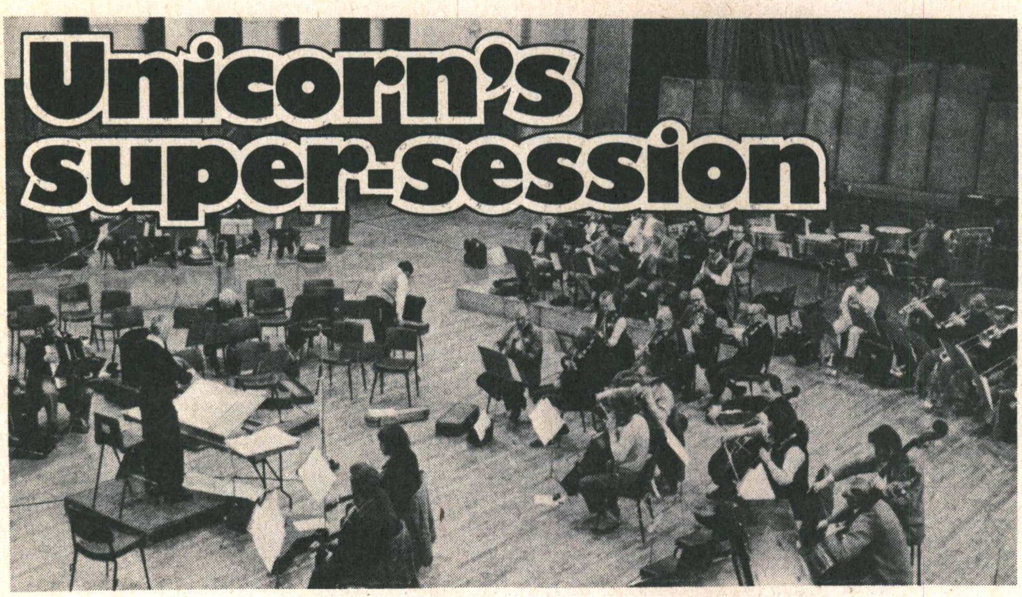
The Hafler DH-101 Pre-amplifier. Kit **£184.** Assembled **£276.** The Hafler DH-102 Moving Coil Pre-Amplifier **£74.75**
The Hafler DH-200 Power Amplifier (100 watts per channel) Kit **£299.** Assembled **£391.** All prices include VAT

Please send me full information on the Hafler Amplification System.

Name______________________________Address______________________________

Post to: Howland-West Ltd., 3-5 Eden Grove, London N7 8EQ. Tel: 01-609 0293

Unicorn's super-session



WE'VE all been hearing a lot about digital recording recently — you know the system which provides phenominal dynamic range by recording digital pulses on a video tape machine and then converting them back to ordinary analogue audio. So, it was with some interest that I went along to the Assembly Hall at Walthamstow Town Hall on March 13th to witness a digital recording in progress for the ambitious British label, Unicorn, headed by John Goldsmith, making use of the Calrec Soundfield microphone.

The Soundfield microphone, for the uninitiated, consists of four microphone capsules arranged in a tetrahedral array in one protective shield. The microphone outputs are *never* used raw but are processed to provide four or two channels of information for recording purposes. The four-channel signals are known as B format and if recorded in this form those signals can be processed *after* the recording session in order to alter the microphone's axis (or axes) and pickup characteristics. These modified signals can then be converted to mono, or a stereo pair or to a two-channel matrix HJ or three-channel Ambisonic signal for multi-speaker playback *via* a reproducing system. This playback could even include eight speakers to provide height!

It's important to note that no attempt is made to convert the signals back to B format from two or three channels, which would be impossible, and undesirable (remember the ill-fated four channel).

Unicorn are the record company venturing into these as yet barely chartered waters. They have used the Calrec microphone before with digital recording, but last time they also used a multi-miked set up for backup. This time had to be right with one microphone only — no going back and doing it again!

The ultimate aim is to issue the first digital Ambisonic record encoded in HJ (as jointly agreed with the BBC and used for their experimental Prom broadcasts). This should re-stimulate public interest in multi-speaker playback, latterly mis-named as four-channel. The Ambisonic system is, however, vastly superior to the old wrong-headed four-channel concept and should not be confused with it.

When I arrived, the microphone was in position some 4.5 metres (15 feet) behind the conductor's podium and about 2.5 metres (eight feet) up. The musicians were just arriving too and so, though the morning had been spent setting up the recording equipment, there had been no opportunity to move things around to alter musical balance. Despite this, producer Christopher Palmer and conductor Laurie Johnson seemed happy with the subsequent playbacks — the Soundfield microphone simply picked up the sound at that point in space.

As its name suggests, this revolutionary microphone collects the *total sound field* for processing and I would hazard a guess that it should largely free the balance in the control room and get on with more creative things. One drawback did occur though, and that is the microphone with its all-encompassing response picked up literally every tiny noise from a bacon slicer in a distant room to clicks or clonks every time a musician put something on the floor or squeaked his chair! Close miking reduces this sort of intrusive noise, but what a mess it makes of the sound!

On the technical side, I was surprised to find Professor Peter Fellgett of Reading University (who has been involved with the development of Ambisonics and the Soundfield microphone since its early beginnings) sitting behind an Ampex ATR 104 four-track analogue tape machine running at 30 ips (no Dolby).

He and his assistant were making a B-format recording of the occasion, while feeding a two-channel stereo/Ambisonic signal in HJ format to the digital processor for recording on the video machines.

These were manned by Peter Jensen of Digital Recording Systems Co. Inc. and the President of the company Terrance Tobias. Apparently, Digital Recording Systems will fly their equipment worldwide to offer their services and are one of only two companies to do this (so they tell me). The other is Soundstream who are responsible for the Telarc discs distributed by Unicorn Records.

Both men were keen to tell me all about their equipment, facilities and service. Two Sony BVU 200 video recorders were in use with a Sony 1600 16-bit digital processor and a Sony Professional Editing control unit. This editor is not as flexible as the one demonstrated by Tony Faulkner at the AES Show in February, and can only make simple edits. Continuous musical takes were therefore the order of the day with no cosmetics afterwards!

Two BVU 200s were used in tandem simply to provide a back up — just in case. It came as a surprise to find a Mark Levinson pre-amplifier in use — a hand-made professional type for studios designated NP-2 — together with 'special' Mark Levinson silver phono cables which I'm told originate from Switzerland.

Back in the States, Digital's monitoring equipment includes Mark Levinson's double stacked Quad electrostatics with Decca ribbon tweeters and 15-inch Hartley woofers, all driven by Mark Levinson electronics through very thick special speaker cables — again of Swiss origin. Nice to see that special cables and good-sounding equipment aren't relegated to the 'lunatic fringe' by this Stateside company at least!

I'm running out of space to talk about the analogue-versus-digital debate which can wait for another time, but the two recording teams were polarised between these camps. Professor Fellgett's feelings about what digital has for and against it roughly tallied with my own, (*ie* some points for: some against) while Digital Recording Systems' attitude was best summed up by the daggers stare I got from Peter Jensen when I dared to suggest that the digital playback was slightly hard and bright! (It seems that at lunchtime the two recording teams went into different bars in the pub).

Enough of this, what of the music? All I can say is that if you fancy the film music of Dmitri Tiomkin from *High Noon*, *Duel In The Sun*, *Rio Bravo*, *Giant* and *Red River* played by the London Studio Symphony Orchestra with the John McCarthy Singers, Baratone Bob Saker and conducted by Laurie Johnson: then wait for this record. It promises to be very interesting from a number of view points.

Dave Berriman

Have you heard the one about . . .

THERE is probably no more of an 'in-joke' than the musical joke. It tends to sort out, in musical terms, those who are clever enough to understand it from those who are not sufficiently musical in order to get the hang of it.

Some of the finest musical jokes in the classical repertoire are, indeed, so erudite that they pass way over the heads of normal mortals. I am thinking in particular of a magnificent set of double organ concertos written by an anonymous composer for a German nobleman. These delightful concerti, play off one organ against the other in a sort of musical war which is both very clever and very, very funny.

Jokes extend from the comic instruments in Mozart's *Toy Symphony* right through to the more subtle *'Farewell Symphony'* of Haydn.

To be appreciated by more than just musicians, then, the musical joke has to steer a course between overt slapstick at one end and unbridled erudition at the other. It is, in short, one of the most difficult things to bring off adequately.

The late and much-loved Gerard Hoffnung managed to attain the right balance for the musical joke so well and many, like myself, will retain fond memories of those evenings at the Royal Festival Hall when the finest musicians in the land combined to indulge in the fun of their art. Recordings of those Astronomical Concerts are cherished relics.

Humour in the United States

The music page

tends to be very much a part of America which travels, like certain good wines, very badly. The things which make our American cousins roll in the aisles do not always have the same effect on us.

However, this is no inviolate rule and among the many happy exceptions has been the work of Peter Schickele. If you have not heard of him, then perhaps you know him better through his monumental discovery of the music of P D Q Bach. Schickele is a trained musician who has taught at the Juilliard in New York, has had works commissioned by the St Louis Symphony Orchestra and, in general, is no unmusical hack.

Of course, P D Q Bach has been overlooked by musical historians, a situation explained by Schickele in the introduction to his hilarious book on this composer when he writes: *"He was thirty-five years old before he began composing, writing the works that were to catapult him into obscurity."*

The book, now three years old, remains as one of the funniest on my shelves. We are told how P D Q Bach, when he died, was buried in a very grand grave but how his family were able to have his body moved to an unmarked pauper's grave . . .

The titles of P D Q Bach's listed works make interesting reading. There are, for example, the *Trance and Dental Etudes; Echo Sonata for Two Unfriendly Groups of Instruments; Pervertimento for Bagpipes, Bicycle and Balloons; Serenude; The Stoned Guest; Concerto for Piano vs Orchestra; Erotica Variations;* and cantata *Iphigenia in Brooklyn'*, the oratorio *The Seasonings; Sonata for Viola (four hands); Toot Suite; Fanfare for the Common Cold;* plus a host of undiscovered works.

The other day I was minding my own business when a thud on the floor announced the arrival through the letter-box of another gramophone record. Since it turned out to be one which is unclassifiable in any of our record reviews sections, I have chosen to present it to you in this way. It is called *'An Historic Return — P D Q Bach at the Carnegie Hall'* and stars 'Professor' Peter Schickele, the Royal PDQ Bach Festival Orchestra conducted by Jorge Mester and including the Okay Chorale directed by John Nelson. The record is on the Vanguard label and is numbered VSD 79223.

It is, of course, taken from a live concert, and indeed the audience plays an important part in the enjoyment of this disc. Schickele himself introduces each side, the first of which presents *'The Seasonings'* in all its beauty. This truly hilarious work, whose opening chorus is *'Tarragon of virtue is full'* and which features a chorus called *'then she gave in'*, is among the funniest things you could wish to hear on disc. Soprano Lorna Haywood sings the aria *'If you've got the money, honey, I've got the time'*. Other soloists, all fine singers, include Marlena Kleinman *(alto)*, John Ferrante *(tenor)* and William Woolf *(bass)*.

Side two starts with the third and fourth movements of the *'Unbegun Symphony'* which Schickele confesses to having written himself. Familiar themes in this work, he tells us, have ensured that his music is whistled in the streets, so spreading its popularity. The *'Pervertimento for Bagpipes, Bicycle and Balloons'* which follows contains some fine solo passages for bagpipe chanter and bicycle which should not be missed. Movements include an *allegro moulto* and a *minaret and trio . . .*

Since, thank Heavens, there are no other performances on record, this has to be the definitive one.

The humour is carefully contrived slapstick of the best type. The use of the play on words, for example, allows the tenor to sing *'See, see, see, C sharp!'* — with suitable change of pitch for that last *'see'* — the sharp one!

Recording quality? Who really cares, but it is pretty good. Stereo separation? Yeah — sure. I got bicycles coming out of one speaker, bagpipes out the other and an orchestra in the middle — is that OK enough? You will like this one, I am sure.

Arthur Ord-Hume

. . . the organ that's a hovercraft!

WHAT, you may ask, is the connection between a hovercraft and a pipe organ — a massive, modern concert organ at that!

The answer is simple — they are one and the same thing if you happen to visit the Adelaide Festival Theatre in South Australia. Before confusing you still more, I will 'come clean' as they say and reveal all!

As part of the commemorations for the Queen's Jubilee in 1977, the Adelaide Festival Theatre, part of the Adelaide Festival Centre which is a versatile and highly successful centre for the performing arts, decided to commission a new concert organ which could also be used in the operas which form a major part of the theatre's season.

The aptly-dubbed Silver Jubilee Organ was henceforth ordered from the famous Austrian firm of organ-builders, Rieger-Orgelbau, and built in the village of Schwarzach over a two-year period.

The specification is impressive and more than adequate for the job which it has. But it is not so much the number of pipe ranks or the sound of the organ which has excited the world of both music and engineering, but a most ingenious ancillary mechanism built into the giant 13,500kg instrument — one which Father Willis and Arp Schnitger could never have dreamed of.

It was considered necessary to be able to move the organ about the stage of the theatre so that when it formed a solo or recital instrument it could take a foremost position — and when it was purely an accompaniment instrument, it could be tucked back — if you can call it 'tucked back' when you have a monster standing 7.3 metres high, 8.4 metres wide and 2.5 metres deep.

Now one of the prime functions of the theatre is to act as a venue for ballet and a stage upon which ballet is regularly performed must have and retain special qualities. It must be resilient and responsive underfoot. The Festival Theatre stage has wooden flooring to achieve the desired resilience and responses. Although it can support very large overall loads, its ability to withstand concentrated loads is extremely limited.

How, then, could the Silver Jubilee Organ achieve mobility without causing damage to both it and the stage? The answer is to use the hovercraft principle, providing the bottom of the organ with six large air-cushion pads or 'air castors'. These operate by forming a very fine film of air between the pads and the floor.

This air film reduces friction between the base of the organ and the stage floor to a very low value so that the lateral force needed to move the organ is very small.

When the organ is to be shifted, two tiny hand-operated tractor units are attached to the base. These are equipped with controls for the castor air supply, safety interlocks and the small air-operated motors which provide tractive effort. A compressor in the theatre's plant room provides high pressure air for each of the six 1.2 metre diameter castors through air outlet points in the stage. Once the air to the castors is turned off, the organ settles gently on to large foam plastic pads which ensure that its weight is evenly and safely distributed.

Moving the organ only requires the services of two people and the instrument can be taken from its backstage 'garage' to the recital position at the front of the stage in less than ten minutes.

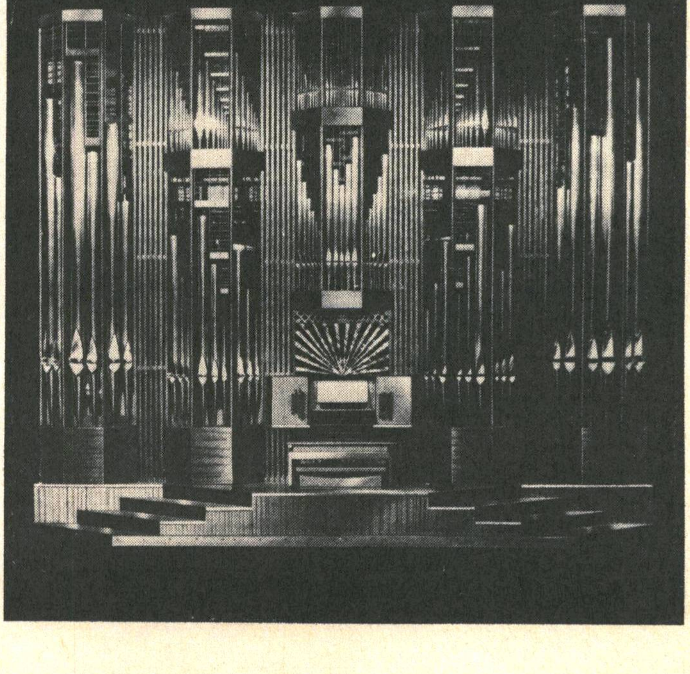
The organ was completed at the close of last year and took four months to ship to Australia and assemble in the Theatre. The inaugural concert took place on April 4th this year, Peter Hurford taking the bench.

The instrument has mechanical or tracker action and electric stop selection. It is self-contained with the exception of the two largest stops of the pedal department (a 32ft Bombarde and a 32ft Untersatz) which are permanently mounted above the theatre's proscenium arch and operated electrically. Designed by the legendary Josef von Glatter-Gotz, owner of the Austrian firm of organ builders, this three-manual instrument is also provided with a second keyboard console from which the instrument can be played electrically from the orchestra pit.

The world's first hovercraft concert organ is now in regular use 'down under' and has been widely acclaimed by performers and critics alike.

Arthur W J G Ord-Hume

A full-frontal of the 'hovercraft' Silver Jubilee organ.



Big names in hi-fi at low, low prices-if what you want isn't listed call us now!

FREE DELIVERY • FREE DELIVERY • FREE DELIVERY • FREE DELIVERY *(U.K. ONLY)*

AMPLIFIERS

Armstrong	
621 teak or rosewood	£109.00
Hitachi	
HA3500S	£79.00
HA5700S	£169.00
HCA6500	£69.00
HMA6500	£119.00
HA7700	£219.00
JVC	
AS5	£69.00
JAS22	£99.00
Pioneer	
SA408	£59.00
SA508	£93.00
SA608	£129.00
SA708	£169.00
Quad	
33, 44, 303, 405	☎
Rogers	☎
A75 Mk. 2	
Sansui	
A40	£69.00
A60	£95.00
A80	£129.00
AU217 Mk. 2	£110.00
AU317 Mk. 2	£167.00
Sugden	☎
A48	
Technics	
SU8011	£79.00
SU8022	£99.00
SU8055	£169.00
SUZ2	☎
Trio	
KA305	£89.00
KA405	£139.00

CASSETTE DECKS

Aiwa	
ADM700	£249.00
AD2000	£149.00
AD6350	£152.00
Bang & Olufsen	
Beocords in teak or rosewood 1900	☎
Dual	☎
C830	
Hitachi	
D30S	£99.00
D40S	£116.00
D75S	£169.00
JVC	
KDA2	£92.00
KDA3	£140.00
KDA5	£195.00
KD10	£120.00
KD720	£89.00
Pioneer	
CTF500	£88.00
CTF600	£107.00
CTF650	£169.00
CTF750	£209.00
Sansui	
D90	£85.00
D100	£112.00
SC1330	£139.00
Sony	
TCK55 Mk. 2	£179.00
TCK65	£219.00
TCK75	£269.00
Technics	
RSM10	£99.00
RSM24	☎
RSM45	

Toshiba	
PCX20	£129.00
PCX40	£148.00

CASSETTE RECEIVERS

Bang & Olufsen	
Beocentres in teak or rosewood	
2600 and 4000	☎

HEADPHONES

AKG	
K40	£14.90
K80	£24.00
K141	£32.00
K240/4	£45.00
K340/4	£79.00
Beyer	
DT440	£29.00
Koss	
Pro 4AAA	£56.50
K6ALC	£23.90
K6A	£20.75
Sennheisser	
HD400	£12.00
HD414X	£21.00
HD420	£24.00
HD424X	£30.00
HD430	£33.00
HD224X	£41.00

LOUDSPEAKERS

Audiomaster	
MLS1, MLS4	☎
Bang & Olufsen	
Beovox S45/2 teak	☎
Beovox S45/2 rosewood	☎
C40 alum	
Bowers & Wilkins	
DM11	☎
DM12	☎
DM7 Mk. 2	
Celef	
Domestic II Super	☎
Monitor Improved	☎
PE1	
Celestion	
County	£89.00
Ditton 15XR	£123.00
Ditton 332	£242.00
Ditton 551	£363.00
Chartwell	
PM110	☎
PM210, PM410	
Harbeth	
HL Pro monitors	£299.00
Jim Rogers	
JR149	£147.00
JR150	£222.00
KEF	
Corelli	☎
Calinda	
Concord 111	☎
101	
104AB	☎
104AB Kit	
105 Mk. II	☎
Celeste 111	
Mordaunt-Short	
Carnival tk/walnut	☎
Festival tk/walnut	
Pageant tk/walnut	☎
Signifer tk/walnut	
Namco	
Micro 100	£59.00
Quad	
Electrostatic	☎
RAM	
Compact	£86.00
CD10	£114.00
CD20	£145.00
100	£166.00
150	£209.00
200	£265.00
Reference	
Standard	£169.00
Rogers	
Export Monitors	☎
LS5/3A	
Spendor	☎
BC1	
Videotone	
GB3	£50.00
Minimax II	£44.00

MUSIC CENTRES

Bang & Olufsen	
Beocentres teak or rosewood	
4600	☎
Toshiba	
SM2950	£269.00
SM3350	£309.00

PICK-UP-ARMS

Infinity	
Black Widow	£129.00
Signet	
XK50	£119.00
SME	
3009 fixed	£62.00
3009/S2	£69.00
3009 Series 3	£116.00
3009 Series 3S	£83.00

PICK-UP CARTRIDGES

AKG	
P6E	£20.00
P8ES	£65.00
P8E	£56.00
P7E	£30.00
Audio Technica	
AT30E	£39.00
Grado	
FCE + 1	£13.75
F3E +	£19.25
F2 +	£29.50
F1 +	£41.75
Glanz	
MFG-11T	£15.70
MFG-31E	£25.21
MFG-31L	£30.34
MFG-51E	£39.18
MFG-51L	£50.66
MFG-71E	£72.37
MFG-71L	£86.84
Ortofon	
LM20	£35.00
LM30	£43.50
MC10	£43.00
MC10 Inc. Trans	£65.00
M20E Super	£46.00
MC20 Moving coil	£59.00
M20FL	£54.00
VMS20E Mk 2	£25.00
MCA 10 Pre amplifier	£59.00
F15E Mk 2	£21.00
FF15E Mk 2	£15.00
Concorde 20	£42.00
Concorde 30	£56.00
Reference	
Spectre 1	£79.00
Ultimo	
10X	£53.00

RECEIVERS

Armstrong	
625 teak or r/wood	£170.00
626 teak or r/wood	£199.00
Bang & Olufsen	
Beomasters in teak or rosewood	☎
2200, 2400	
Hitachi	
SR504L	£119.00
SR604	£145.00
SR2010L	£85.00
JVC	
RS5L	£109.00
RS7	£129.00
Pioneer	
SX590	£124.00
SX690	£149.00
SX790	£199.00
Sansui	
R30	£89.00
R50	£119.00
R70	£149.00
Trio	
KR2010L	£97.00
KR3010L	£124.00

REEL TO REEL

Revox	☎
B77 2 or 4-track	
Sony	
TC399	£265.00

TUNERS

Armstrong	
623 teak	£135.00
623 rosewood	£137.00
624 teak	£104.00
624 rosewood	£106.00
Dual	☎
CT1140	
Hitachi	
FT4000	£89.00
FT5000	£139.00
JVC	
TV3L	£79.00
TV5L	£99.00
T40P	£169.00
Pioneer	
TX408L	£59.00
TX608L	£92.00
Quad	☎
FM3	
Sansui	
T60	£69.00
T80	£99.00
TU217	£97.00
TU317	£110.00
Sugden	☎
T48	
Technics	
ST8011L	£89.00
ST8044L	£139.00
ST8055	£169.00
STZ1L	☎
Trio	
KT413	£134.00

TURNTABLES

ADC	
1600DD	£69.00
Aiwa	
AP2400	£99.00
Bang & Olufsen	
Beograms in teak or rosewood	
1700	£99.00
2202	£154.00
Dual	
CS506	☎
CS522	
CS606	☎
CS626	
CS714Q	☎
CS731Q	
Hitachi	
HT324	£59.00
JBE	☎
Series 3 slate	
JVC	
QLA5R	£109.00
LA55	£79.00
Mitchell	
Focus One excl. arm	£125.00
Focus One inc. arm	£195.00
Pioneer	
PL512	£49.00
PL200X	£89.00
PL300X	£109.00
PL400X	£129.00
Sansui	
SR222 Mk 2	£69.00
Technics	
SLB2	£69.00
SLB3	£85.00
SLQ2	£129.00
SL1700 Mk 2	£198.00
SL1800 Mk 2	£174.00
SLQ33	☎
Sony	
PSX40	£130.00
Thorens	
TD 160 Super	£141.00
TD 160 Mk 2BC	£100.00
Trio	
KD1033B	£49.00

MICRO HI-FI

Aiwa	
Micro System excl. spkrs	£369.00
Aurex	
Amplifiers	☎
SB-A10 (Integrated)	
SY-C12 (Pre-Amp)	☎
SC-M12 (Power-Amp)	
SY-C15 (Pre-Amp)	☎
SC-M15 (Power-Amp)	
Cassette Decks	☎
PC-D10	
PC-D15	☎
Tuners	
ST-T10L (3-wave band)	☎
ST-F15 (Digital FM)	

RACK SYSTEMS

Hitachi • JVC • Sansui	☎
Pioneer	
X33	£298.00
X55H	£430.00
X55V	£445.00
X77H	£485.00
X77V	£499.00
Technics	
System 80	☎

Most of the equipment listed is on comparator demonstration at both showrooms.
All prices include VAT. Credit terms available.
Post coupon or order by phone using your credit card number.
Prices and stock shown are correct at the time of going to press.

Chew & Osborne

26 King Street, Saffron Walden, Essex. Tel: (0799) 23728
Closed Thursday

148 High Street, Epping, Essex. Tel: (0378) 74242
Closed Wednesday

Chew & Osborne 26 King Street Saffron Walden Essex Please supply

Make ____________ Model ____________

Cheque PO enclosed for £ ____________ or charge my

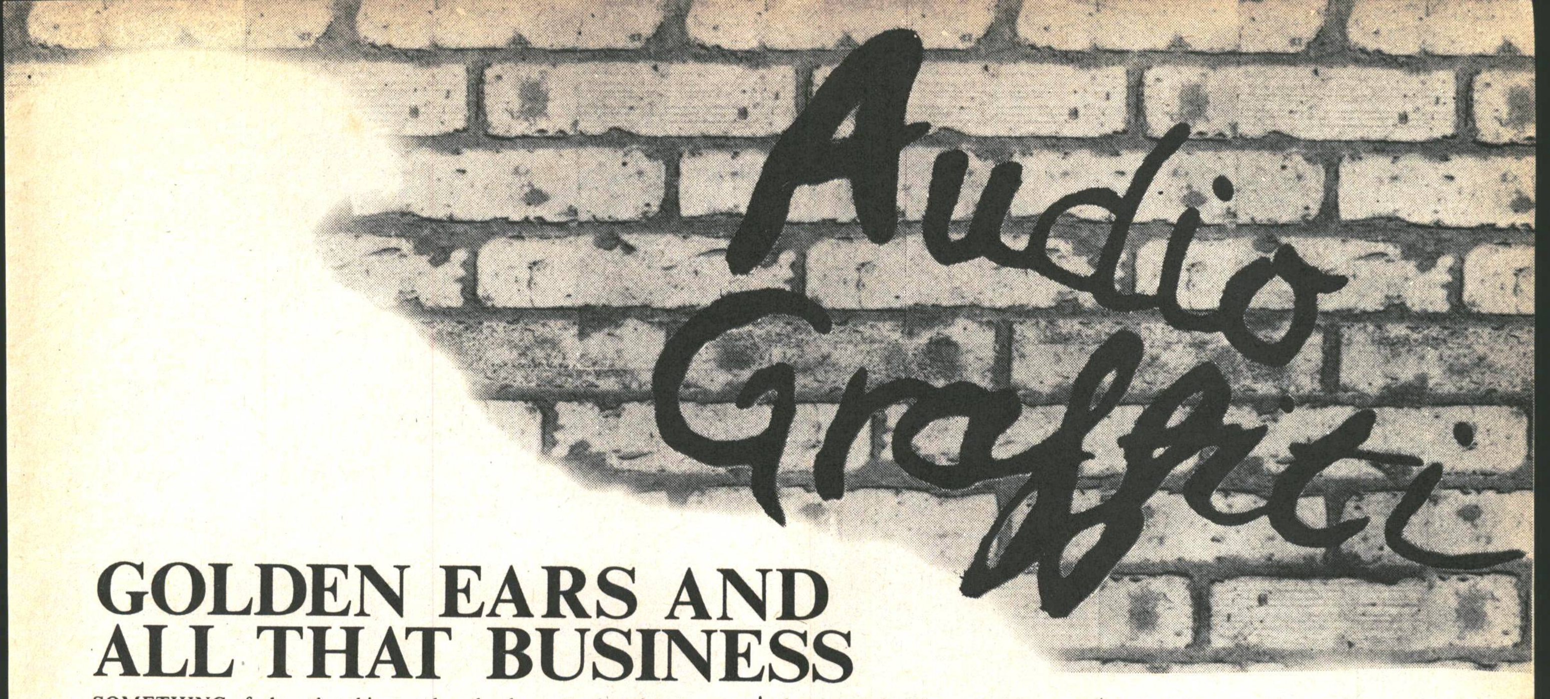
credit card account ____________ Signature ____________

Name ____________

Address ____________

____________ (Phone) ____________

PHF7



GOLDEN EARS AND ALL THAT BUSINESS

SOMETHING of a breather this month and a chance to chat about one or two things from a slightly different viewpoint. It is a funny thing this hi-fi business: the more you learn, the less you seem to really know what is actually going on. The other thing is that try as you might to avoid the fact, there is an incredible amount of work that has already been done and virtually forgotten. We supposedly live in an enlightened age then you come across something like this which reinforces the comment . . .

There's nothing new under the sun

". . . he is one of that small band who have dedicated a good part of their lives to extending the range of reproduced sounds to the limits of human hearing. Merely reproducing the highs and lows to which most pre-war instruments are deaf will not satisfy Tom Kennedy or any other golden ear. A purist, he insists that the tones be noise-free and undistorted, sharp, clear and full from treble to bass. The only damper his enthusiasm seems to know — so far not very effective — is the fact that when fidelity even approaches the degree achieved in his laboratory, the cost graph rises like a helicopter.

Kennedy has gone to fantastic lengths. His main amplifier was built at the Bell Telephone Laboratories. His loudspeaker has three units. To forestall phonograph vibration, the motor is mounted separately, while a dental-machine belt carries the rotary motion to a turntable anchored in 600 pounds of sand. The pickup arm sports a featherlight sapphire needle, kept at even temperature and humidity in an air-tight container until just before it is used. Kennedy makes his own superior recordings of broadcast music. As a result his 'parlor concerts' are unsurpassed for fidelity. He has been making a fetish of it, of listening to tone rather than music. *"Listen!"* he says, *"Compare music from my equipment with what the average combination gives. You'll go home and throw rocks at your set"*.

Tom Kennedy, wherever you are, your spirit lives on and the crazy thing is this was from an interview in *'Fortune'* magazine way back in 1946 (re-printed in *From Tin Foil To Stereo* by Oliver Read and Walter Welch, H.W. Sams & Co.). So there you are, they even had 'golden ears' and all that business years ago. But I wonder what Mr Kennedy would make of today's systems? In this business (and I suppose others like it) there is always a great danger of running out of superlatives. Up here at the sharp end the problem is even more acute. By being enthusiastic to praise things there is a danger of seeming too enthusiastic. It is really a problem of relative scale than absolute. Relative to something else there may be an enormous difference. In absolute terms we may well be a long way from our objective. So — for one month only — let's talk about absolute things. Is there a perfect system? Or have we still got a long way to go in spite of all that has been achieved?

The long and winding road

We've come a long way but that doesn't mean anything. It is a long way to walk from Watford to Oxford but nothing compared with walking round the entire British Isles. But then you might argue that you can't walk all the way round the British Isles — at least not in practice, not without cutting corners. And so it might be with hi-fi. We may never be able to reproduce a live concert precisely, but we should be able to reproduce the original recording in spite of the fact that we still have a considerable amount of ground to cover.

Now you hear it, now you don't

No domestic system I've ever heard can match the sound in a good studio. There is an almost indefinable quality that is always totally missing. And it is not just a question of listening to the sound directly from the microphone(s). The effect is there when heard off tape. There seem to be at least three (tangible) missing qualities. The first is weight. We only get a vague idea on a hi-fi system of the power behind a cymbal crash, the deep multi-layered textures in a gong, the true 'breathy' quality of the human voice, the hard smack of a crisp snare drum, the real blast in an uninhibited trumpet note or the rasp of a trombone.

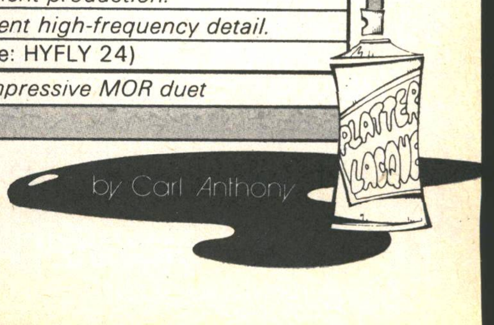
The second thing is balance. Hi-fi systems can't differentiate. Loud sounds mask quiet sounds. They tend to use up all the energy and take up all the 'space' in the listening room. In the studio (or in real life) there is no reason why you cannot have a bass guitar literally blasting away and still hear (and feel) the sound of say a person drawing his thumb across the skin of a tambourine. A very real and totally separate sound.

The final thing is silence. Despite Dolby A, dbx or what have you. Even if you don't use a noise reduction system there is a quality of silence in a studio you never hear from hi-fi. Silence from a hi-fi system is just simply the point where there is no programme. In the studio, silence has a different quality — it has presence, ambience if you like. With hi-fi everything just simply stops working. There is a mad clamour to get higher output but how good is your system at say −50dB? There is still information being picked up by the microphones at this level in the studio (they're not that dead!). Is your system capable of reproducing it accurately?

THE TEN COMMENDMENTS

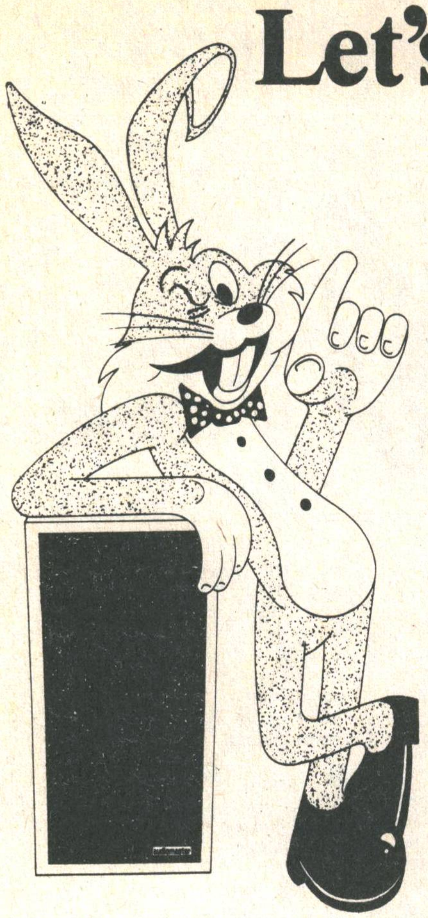
1. **ESTHER** — Esther Ofarim (Audio Trade: ATR 001) — *Stunning vocal presence.*
2. **THE WALL** — Pink Floyd (EMI: SHDW 411) — *Better even than 'Dark Side'*
3. **RICKIE LEE JONES** — Rickie Lee Jones (Warner: K56628) — *American production at its best.*
4. **ALL FLY HOME** — Al Jarreau (Mobile Fidelity: MFSL 1-019) — *Clean sound, very low distortion*
5. **COMMUNIQUE** — Dire Straits (Vertigo: 9102 031) — *Superb production, excellent music.*
6. **UNORTHODOX BEHAVIOUR** — Brand X (Charisma: CAS 1117) — *Dramatic sound, one of their best.*
7. **PYRAMID** — Alan Parsons (Arista: SPART 1054) — *The kitchen sink and more!*
8. **SHOOTING STAR** — Elkie Brooks (A & M: AMLH 64695) — *Tight sound, excellent production.*
9. **TOUCH** — John Klemmer (Mobile Fidelity: MFSL 1-006) — *Re-mastered, excellent high-frequency detail.*
10. **SURPRISE, SURPRISE** — Marion Montgomery/Richard Rodney Bennett (Cube: HYFLY 24) — *Impressive MOR duet*

Reference system: Linn Sondek LP12 turntable, Grace arm, Koetsu cartridge, Naim 32/250 pre- and power amplifiers, Linn Isobarik loudspeakers, Sennheiser and QED 79-strand connecting leads



by Carl Anthony

Let's chew over the facts !



The facts about Amplifiers

The most recent additions to our range are the CRIMSON pre and power amps. offering 100 watts for around £400 and the long promised LENTEK integrated amp. selling at £645. Both of these new models are very high performance units and a welcome addition to the growing range of British made electronics.

Most people seem to judge amplifiers by relating power output to price. Sometimes less power with lower levels of distortion can be more effective, although not necessarily cheaper to buy. Your amplifier power requirement will be directly related to the size of your listening room, its degree of damping and the speakers you select.

We've now got in stock the world-famous BRYSTON power amps. (from Canada) a typical example of how good clean distortion-free performance can sound louder than nominally higher powered units. BRYSTON have received really excellent reviews in North America and prices start from just under £300.

There are a number of good pre-amps. suitable for use with BRYSTON such as the CRIMSON or the new ELITE 600C. You can set yourself up with a really superb powerful pre/power amp. combination for under £500.

Less expensively the A & R A60 and SUGDEN A48 integrated amps. still prove very popular and rightly so.

If you're handy with a soldering iron the HAFLER Kits for both pre and power amps. can certainly save you money and without any sacrifice in performance – they really do go!

No review of high performance amps. would be complete without mentioning MERIDIAN, NAIM and QUAD. They require little introduction from us being already well accepted and very popular.

Just a word about valves – if you want to hear something really special listen to the BEARD (B.A.S.) – there's one on dem' at Wigmore St.

The facts about Turntables

In recent months we've talked about the fact that until quite recently nobody took any notice of turntables. It was said that if they revolved at the right speed then it was OK.

That's all changed, turntables must now be the most talked about subject in the hi-fi press. Turntables are now listened to avidly and compared with the reference – the mighty LINN-SONDEK. Just recently there has been a spate of potential LINN beaters and some of them have unquestionably something to offer.

The new SYSTEMDEK developed by Peter Dunlop and the latest version of the ARISTON RDIIS have both received accolades from the press very recently and to judge by demand are likely to find a ready acceptance in the market. STD have brought out a less expensive version of their basic design called the 305S at around £150 and this seems good value.

One of the turntables we get very excited about is our own modified version of the THORENS TD160BC which improves dramatically the performance of this low price unit. Selling for £155 this model offers the opportunity to accommodate a high performance arm and cartridge for those with a limited budget.

Other recommended models are the DUAL CS506 (replacing the very popular CS504), the SANSUI SR222 for low-cost high performance and for those who want an inexpensive turntable on which to mount the arm of their choice, what better than the standard TD160BC. For those with limited budgets try one with a MAYWARE arm for just over £150 and we'll even fit the arm for you.

Incidentally, you can make an audible improvement to most turntables at a cost of under £25. How? We'll let you in on the secret – get a PLATTER PAD – it's the original high performance turntable mat from the USA – come and have a listen, you'll be amazed!

The facts about Arms and Cartridges

Whats new? Well there's a nice new KOETSU cartridge at £500 – expensive yes, but probably the best sounding cartridge available – currently "state-of-the-art". There's also a very interesting new range of cartridges named GLANZ with models from just over £15 through to just under £90. They really sound excellent and have already caught the eye of the press who have written very well of them. In pick-up arms the most significant introduction is the AUDIO TECHNICA SIGNET arm which performs superbly, is beautifully engineered and sells for around £120.

If ever there was a need for careful matching it's between arms and cartridges. A mis-match can have the most abysmal effect on your whole system. We cover the spectrum of arms from the MAYWARE at under £50 through to the superb LINN ITTOK at £230, plus cartridges from £14 through to nearly £500. Current favourites are the ELITE, GLANZ and GRADO ranges with a wide choice of moving coils from the MAYWARE MC2C through to the magnificent LINN ASAK at £184.

There are some really interesting accessories to consider. The new ELITE alignment gauges virtually take all the error out of setting up your arm and cartridge. If you're irritated by your arm not lifting from the groove at the end of a record try an AUDIO TECHNICA Safety Raiser – it's really gorgeous. Silver Litz headshell connectors also improve the sound performance for a relatively small outlay.

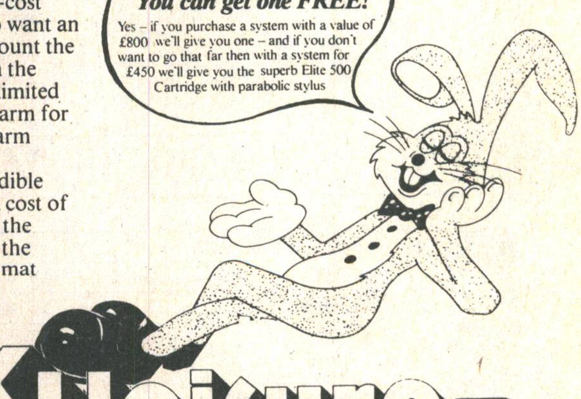
Don't forget a very basic requirement – keep your records clean. There's only one really effective way to do this and that's by the KEITH MONKS record cleaning system – it can make your records sound like new again!

Our Fleet St. branch operates this service.

We sell the Elite MC555 Cartridge for £99

You can get one FREE!

Yes – if you purchase a system with a value of £800 we'll give you one – and if you don't want to go that far then with a system for £450 we'll give you the superb Elite 500 Cartridge with parabolic stylus



Among the brands we stock are the following:–
A & R, Audiomaster, Audio Pro, Audio Technica, B.A.S., B & W, Bryston, Denon, Dual, Elite, Entre, Ferrograph, Grace, Hadcock, Hafler, Harbeth, Hitachi, IMF, JR, JVC, Keesonic, Kef, Lentek, Linn Sondek, Lux, Mayware, Meridian, Monitor Audio, Mission, Mordaunt-Short, Naim, Nakamichi, Neal Ortofon, Onkyo Pad, Philips Black Tulip, Pioneer, Quad Radford, Rappaport, Revox, SME, STD, Sansui, Sony, Spendor, Stanton, Stax, J. E. Sugden, Supex, Syrinx, Systemdek, Tandberg, Tannoy, Teac, Thorens, Ultimo, Yamaha

KJ Leisure Sound

AN AUDIBLE DIFFERENCE

CROYDON 89 London Rd. Tel: 01-686 1343
HARROW 340 Station Rd. Tel: 01-863 8690
LONDON, EC4 53 Fleet St. Tel: 01-353 7935
LONDON, W1 48 Wigmore St. Tel: 01-486 8263
UXBRIDGE 278 High St. Tel: Uxbridge 33474
WATFORD 101 St. Albans Rd. Tel: Watford 45250
OPEN: MONDAY – SATURDAY 9.30 – 5.30 LATE NIGHT THURS (Wigmore St.) UNTIL 7 PM (FLEET ST CLOSED SATURDAYS)

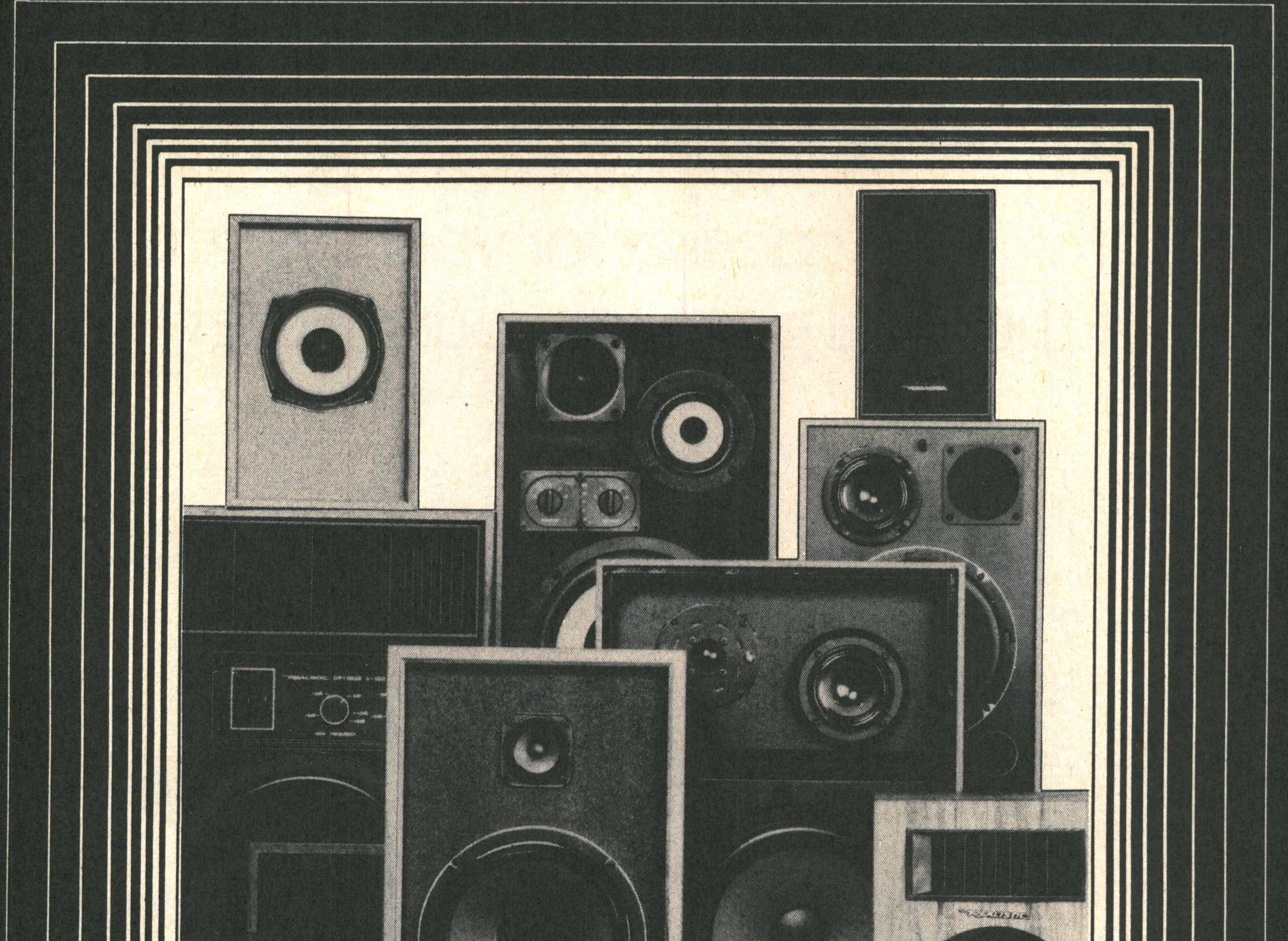
INSTANT CREDIT
Possible on balances up to £500. There's a KJ Budget account offering credit up to 20 times your selected monthly payment.

Buy it with Access
BARCLAYCARD VISA

JANUARY

REALISTIC VIEW

This month's hi-fi highlights from TANDY



Tandy are the world's largest electronics retailer. We have over 7000 stores and dealerships. We sell over $1,500,000,000 worth of products each year. Audio, stereo, hi-fi, microcomputers, in car entertainment, electronics and much, much more.

After sixty years in a highly technological business it's hardly surprising that our range of speakers is amongst the most varied and comprehensive you'll find anywhere.

TANDY

The largest electronics retailer in the world.

speaker spec

the ideal speaker for your system – ...the ideal price for your pocket

MINIMUS 8
120 - 20,000 Hz response from an enclosure only 250 x 120 x 140mm. 10 watts, 8 ohms.
40 - 216
Reg. Price £14.95 each

MC 600
Two way bookshelf speaker with 150mm acoustic suspension woofer and 60mm tweeter, 40 - 20,000 Hz response. **40 - 9166**
Reg. Price £24.95 each

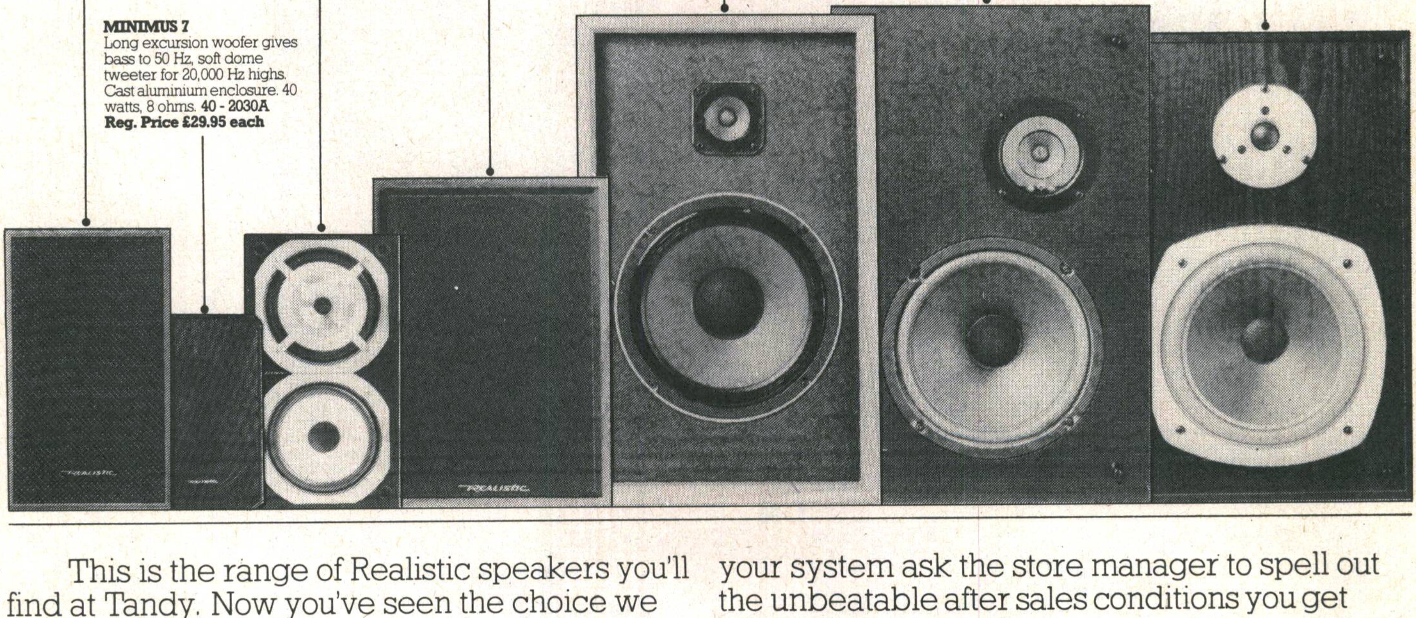
MC 1200
Features a large acoustic suspension woofer and special "foam-suspension" tweeter. 30 - 20,000 Hz response. **40 - 1984**
Reg. Price £29.95

MC 1800
Heavy 20cm acoustic suspension woofer and 7cm tweeter. LC crossover.
40 - 9165
Reg. Price £49.95 each

MC 2200
Two way system with a powerful 20cm woofer delivering deep bass and special 90cm dome tweeter. 35 - 20,000 Hz. **40 - 9164**
Reg. Price £44.95 each

MINIMUS 21
Super small bookshelf speaker system. Two 105mm woofers. Tweeters deliver crisp highs. Black enclosure, 8 ohms impedance. **40 - 9167**
Reg. Price £39.95 each

MINIMUS 7
Long excursion woofer gives bass to 50 Hz, soft dome tweeter for 20,000 Hz highs. Cast aluminium enclosure. 40 watts, 8 ohms. **40 - 2030A**
Reg. Price £29.95 each



This is the range of Realistic speakers you'll find at Tandy. Now you've seen the choice we offer why not visit your local store and hear their performance.

If you'd also like to check out the full technical specifications just pick up the FREE 116 page TANDY catalogue.

When you've selected the ideal speaker for your system ask the store manager to spell out the unbeatable after sales conditions you get when you buy them.

Like our no-quibble satisfaction promise . . . and a FIVE YEAR guarantee.

We think you'll agree that Realistic speakers are the best hi-fi buy for your money you're ever likely to make . . . or our name's not TANDY.

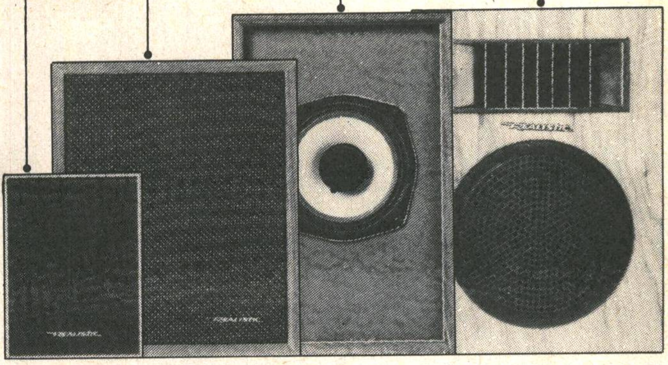
MINIMUS 0.5
Tiny 120 x 188 x 114mm speaker, efficient enough to be powered by portable radio. 40 - 1995
Reg. Price £9.95 each

MINIMUS 3
127mm full range speaker housed in a walnut grained vinyl veneer enclosure.
40 - 913
Reg. Price £9.95 each

MINIMUS 4
No larger than a few books, 127mm woofer delivers 125 17,000 Hz response. 8 ohms.
40 - 224
Reg. Price £14.95 each

MINIMUS 5
100 - 20,000 Hz sound from a shelf speaker small enough to fit almost anywhere. 38mm tweeter, 20 watts, 8 ohms.
40 - 255
Reg. Price £19.95 each

tacular



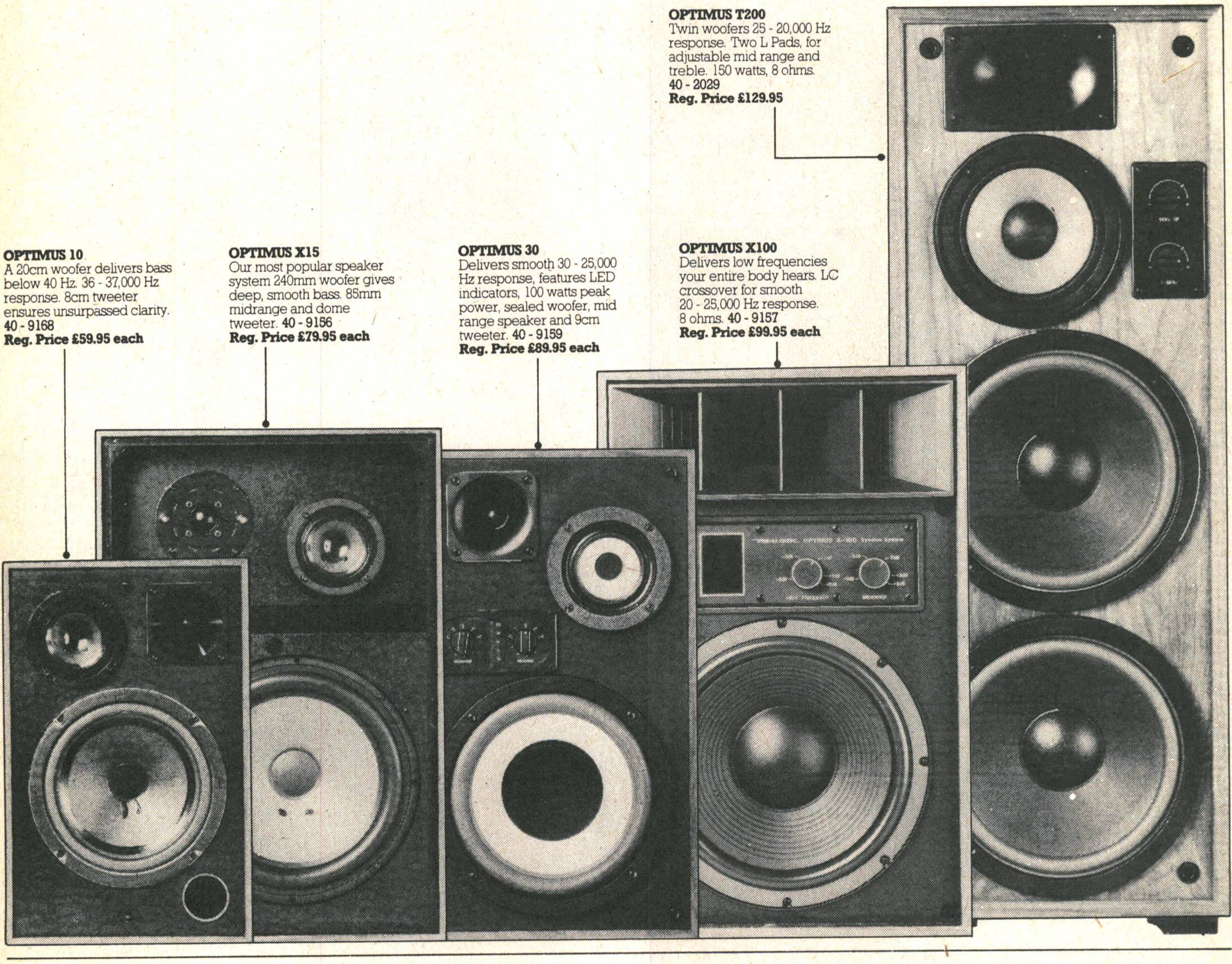
OPTIMUS T200
Twin woofers 25 - 20,000 Hz response. Two L Pads, for adjustable mid range and treble. 150 watts, 8 ohms.
40 - 2029
Reg. Price £129.95

OPTIMUS 10
A 20cm woofer delivers bass below 40 Hz. 36 - 37,000 Hz response. 8cm tweeter ensures unsurpassed clarity.
40 - 9168
Reg. Price £59.95 each

OPTIMUS X15
Our most popular speaker system 240mm woofer gives deep, smooth bass. 85mm midrange and dome tweeter. 40 - 9156
Reg. Price £79.95 each

OPTIMUS 30
Delivers smooth 30 - 25,000 Hz response, features LED indicators, 100 watts peak power, sealed woofer, mid range speaker and 9cm tweeter. 40 - 9159
Reg. Price £89.95 each

OPTIMUS X100
Delivers low frequencies your entire body hears. LC crossover for smooth 20 - 25,000 Hz response.
8 ohms. 40 - 9157
Reg. Price £99.95 each



Just look for your nearest Tandy store
in your local telephone book

REALISTIC
from TANDY

Tandy Corporation, Bilston Road, Wednesbury, W. Midlands WS10 7JN.

Offers subject to availability.
Instant credit available in most cases.

Prices may vary in individual stores.

Access, Barclaycard and Trustcard welcome.

TANDY DEALER Most items also available at Tandy Dealers. Look for this sign in your area.

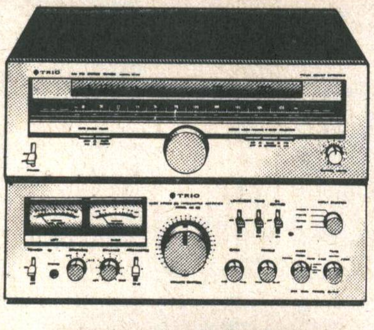
COPPINS

OF WELLING

RADIO TELEVISION AND
HI-FI DEMONSTRATION LOUNGE

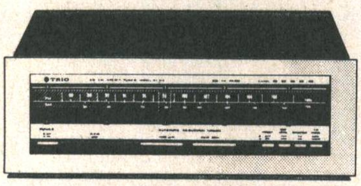
Armstrong Rogers TANNOY QUAD Celestion Dual BRITISH HIGH-FIDELITY B&W Loudspeakers REVOX Technics TRIO Cambridge Audio THORENS spendor AR ITT SONY MICRO SEIKI KOSS SENNHEISER TOSHIBA JR CHARTWELL ELECTRO-ACOUSTICS LIMITED SHURE Connoisseur MISSION ELECTRONICS ortofon EMPIRE audiomaster

TRIO

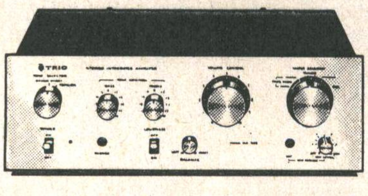


KT-815 STEREO TUNER

KA-801 AMPLIFIER



KT-413 STEREO TUNER



KA-305 STEREO AMPLIFIER

TRIO HI-FI AT VERY COMPETITIVE PRICES

131-137 Bellegrove Road,
Welling, Kent. 01 303-5341.

A HI-FI MARKET

BARCLAYCARD VISA

QUALITY does NOT have to cost very much

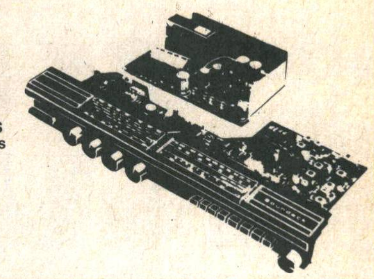
ALL PRICES
INCLUDE VAT
OPEN 6 DAYS A WEEK
ALL WELCOME

G.E.C. STEREO TUNER-AMPLIFIER

4 WAVEBAND STEREO TUNER AMPLIFIER BY G.E.C.

★ MW/LW/SW/STEREO FM RADIO ★ 10+10 WATT STEREO AMPLIFIER ★ INPUTS FOR PU, TAPE IN/OUT. FULL FUNCTIONS
Supplied as two assembled units as illustrated — easy to connect.
SIZES: 2¾" x 15" x 7½"
Amplifier 2" x 7½" x 4½"

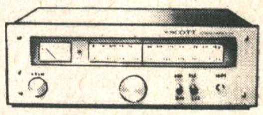
£21.95 U.K. Post etc., £1:50
(NEW BULK PURCHASE)



SCOTT T516 STEREO FM/AM TUNER

High quality stereo fm/am tuner by Scott of U.S.A. Overall size 5" x 14½" x 12". Offered brand new and fully guaranteed at a special low price.

£38.95 C/P £1.55

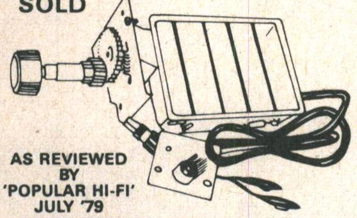


J.V.C. BELT DRIVE TURNTABLE

J.V.C. turntable supplied complete with an Audio Technica AT10 stereo magnetic cartridge.
- ★ 'S' shaped tone arm. Belt driven
- ★ Full size 12" platter.
- ★ Callibrated counter balance weight (0.3 grms.).
- ★ Anti-skate (bias) device.
- ★ Size 12¾" x 15¾".

£29.95 C/P £1.55

1000's SOLD



AS REVIEWED BY 'POPULAR HI-FI' JULY '79 AND SEVERAL OTHERS

TV SOUND FROM YOUR HI-FI

HIGH QUALITY TV SOUND CONVERTOR PLUGS INTO AERIAL SOCKET OF YOUR FM TUNER

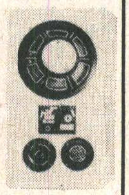
9 Volt Battery operated (batt. not supplied). Nothing to look at, but just listen!

U.K. Post etc., 50p

£8.50
(Price increase as from 1/6/80)

SEAS SPEAKER KITS 8 Ohm

Professional sound hi-fi speaker kits with high sensitivity (89-92dB). Extended frequency response ('223' 50-20kHz, '253' 35-25kHz).
Designed and made in Scandinavia to the highest quality. All supplied with complete cabinet plans, tweeters, crossovers, leads etc.



Hi-Fi 223. 30/45 watt 3 speaker 8" system	**£43.50 PAIR**
Hi-Fi 253. 60/100 watt 3 speaker 8" system	**£34.50 EACH**
Hi-Fi 403. 60/100 watt 3 speaker 10" system	**£44.50 EACH**
Hi-Fi 603. 80/150 watt 3 speaker 8" system	**£64.50 EACH**

PLUS LARGE RANGE OF SEPARATE AND REPLACEMENT SPEAKERS AND TWEEZERS IN STOCK

PIEZOTWEETERS

Clean sound, very low distortion tweeters. No crossover required. Suitable up to 100 watts – more in series.

1. Midrange horn for disco/pa/groups	**£9.50**
2. Tweeter horn for hi-fi/disco/pa	**£6.50**
3. Popular hi-fi and disco	**£4.95**
4. Flat type hi-fi	**£3.95**

POST FREE (U.K.)

FREE CATALOGUE

IN STOCK
Large range of speakers/stereophones/microphones/mixers/PA equipment, etc. and much more.
Plus huge range of test equipment

SEND LARGE 17p SAE

AUDIO ELECTRONICS

All prices correct at 1/6/80 E&OE

301 EDGWARE RD., LONDON W2 1BN
01-724 3564. OPEN 9-6, MON-SAT.

*GE1305 Hi-Fi frequency equaliser	**£62.95**
*1987 economy version	**£49.95**
*Pocket sound level meter	**£22.95**
*Peak programme meter 2 x 200W.	**£39.95**
*Audio output meter 2 x 100W	**£12.95**

*Two channel or stereo

ORDER BY POST, OR TELEPHONE WITH BARCLAY/ACCESS
OR CALL IN AND SEE FOR YOURSELF

FOTRONIX
INTERNATIONAL LIMITED

MAIL ORDER HOME & EXPORT
105-113 LAWRENCE ROAD, LONDON N15 4ET
PHONE 01-802 4131
PHONE IN WITH ACCESS OR BARCLAYCARD

DISCWASHER, ZEROSTAT, GOLD-ENS

Zerostat Anti Static Pistol	£6.66	P.&P. 30p
D3 Record Cleaner	£6.66	P.&P. 30p
Refills D.3 Fluid 1oz.	£0.99	P.&P. 30p
6oz	£4.75	P.&P. 50p
16oz	£8.99	P.&P. 50p
SC-1 Stylus Cleaner	£3.60	P.&P. 50p
Disc Kit (Zero Stat, D3, SC-1, in storage system)	£23.95	P.&P. £1.00
Disc Organiser (storage system only for above)	£8.95	P.&P. £1.00
Z-Track Viscous Pick-Up Arm Damper	£8.99	P.&P. 30p
D-Stat II Fibre Turntable Mat	£2.99	P.&P. 30p
VRP Record Protection Sleeves, 10 for	£1.95	P.&P. 30p
Disc Foot System Turntable Feet	£12.00	P.&P. 30p

Gold Ens Leads (Post/Packing 30p)

2 Phono-2 Phono 0.5m	£5.50	2 Phono-2 Phono 1m	£6.25
2 Phono-2 Phono 2m	£6.99	5 DIN-4 Phono 1m	£8.50

CASSETTE TAPE BARGAINS (Post Free)

	C46	C60	C90	C120
T.D.K. DYNAMIC	.55	.59	.74	£1.15
S.A.	—	—	£1.74	—
A.D.	—	—	£1.35	—
SONY HF	—	—	.99	—
FeCr—		£1.24	£1.76	—
CrO2—		£1.15	£1.51	—
BASF LH-1	—	.93	£1.25	£1.63
Superchrome		£1.55	£1.99	—
MAXELL UL	—	—	.89	—
UD-			£1.23	£1.74
UDXL-1	—	£1.39	£1.69	—
UDXL-11	—	£1.40	£1.78	—

QUAD EQUIPMENT

QUAD 33, 303, 44, 405, AND ELECTROSTATIC SPEAKERS.

WRITE OR PHONE FOR PRICES AND DELIVERY.

FERROGRAPH DEMAGNETISER

For Tape Heads. Mains powered heavy duty.
£14.50 (Post 50p)

CONNOISSEUR BD101

Belt Drive Turntable in plinth & cover, without arm, ready cut for SME arm.
£48.00 (Carriage £6.00)

THORENS TURNTABLES (Carriage £6.00)

TD160 Mk II BC, inc. Base, Cover, SME cut	£96.95
TD160 Super	£137.95
TD104 inc. Arm, Base, Cover	£89.95
TD105 inc. Arm, Base, Cover	£108.95
TD126 Mk. III BC inc. Base/Cover — no arm	£209.95
TD126 Mk. III C inc. Arm/Base, Cover	£255.95

A.D.C. TURNTABLES (Carriage £6.00)

1500FG/QLM34-3	1600DD/QLM36-3	1700DD/XLM-3
£68.50	£87.50	£110.00

A.D.C. SOUND SHAPERS

SS-1, 5-band Graphic Equalizer	£57.24	(P&P £3.00)
SS-110 10-band Graphic Equalizer	£95.00	(P&P £3.00)
SS-2 Mk.II 12-band Graphic Equalizer	£149.24	(P&P £3.00)
SS-3 12-band Paragraphic Equalizer	£207.75	(P&P £3.00)
SLM-3 Sound Level Meter with Test Record	£38.84	(P&P £1.00)

Q.E.D. ACCESSORIES

Peak Programme Indicator P.P.I.2	£32.00
Mains Interference Suppressor (3 amp) 6/2	£14.50
Mains Interference Suppressor — Heavy Duty (6 amp) 6/4	£18.95
Light Switch Suppressor. 6/3	£1.76
Ferrite Rings (Pack of 2) 6/5	£2.45
Mains Distribution Unit — 4 way — 18/1	£12.50
Mains Distribution Unit — 6 way — 9/2	£12.50
Mains Distribution Unit — 4 way in line 18/2	£13.00
Mains Distribution Unit — 6 way in line 28/1	£16.00
Suppressed Distribution Unit — 4 way, 3 amp — 19/1	£18.95
6 amp Plugs for Distribution Units — 9/3 each	.99
Speaker Switching Unit: 2 way — 2/2	£7.50
Speaker Control Centre — Screw. 24/1 or DIN, 24/2	£17.95
Speaker Control Console 8/1	£16.50
Tape Switching Unit, 2 way DIN22/1	£16.95
Tape Switching Unit, 3 way DIN 23/1	£21.95
Tape Swiching Unit, 2 way Phono 22/2	£21.95
Tape Switching Unit, 3 way Phono 23/2	£29.00
Amplifier Switching Unit 16/2	£17.95
Disc Switching Unit 10/1	£10.50
Headphone Adaptor & Control 5/2	£11.95
Headphone Adaptor 2 way 5/3	£8.50
Variable Cartridge Equaliser 26/2	£16.95
Attenuator (DIN to Phono) 14/1	£6.60
Attenuator (DIN to DIN) 14/2	£5.90
Attenuator (Phono to Phono) 14/3	£6.90
Surround Sound Adaptor — Screw 21/1 — DIN 21/2	£22.95
Dust Cover Renovation Kit EL6	£4.90
Electrolube Tape Head Cleaner Spray	£2.99
Electrolube Record Cleaner Spray	£2.99
42 Strand Speaker Cable 13/6 per metre	.30
79 Strand Speaker Cable 13/8 per metre	.70

P&P on cable — 50p per order. Other items Post Free.

Price correct to May 1980. Whilst every endeavour is made to maintain these prices we reserve the right to amend as necessary without notice. E&OE.

PICK UP ARMS

CONNOISSEUR SAU-2	£19.95*
Metal Headshell	£5.25
AUDIO-TECHNICA	
AT1100	£99.95*
HADCOCK	
GH228 Type 'D' inc. lift	£81.75*
GH228 Super E	£64.40*
Spare Headshell	£5.00
S.M.E. Plate	£3.45
1ml. Silicone Fluid	£2.07
2ml. Silicone Fluid	£3.34
MAYWARE	
Formula 4 Mk III	£49.45*
S.M.E. Adaptor	£3.83
Thorens 160 Board	£5.75
Spare Headshell	£5.75
SME PICKUP ARMS	
SME Series III	£105.29*
SME Series IIIS	£75.30*
Damper for IIIS	£10.20
CA1 Arm for Series III	£15.28
3009 II Fixed Head	£57.24*
3009 II Detachable	£62.36*
S2 Headshells	£5.62
FD200 Fluid Damper	£17.38
Damping Fluid	£2.80
Reducing Fluid	£1.90
A.D.C.	
LMF-1 Fixed Head	£64.35*
LMF-2 Detachable	£69.95*
ALT-1 Detachable	£33.50*
ULTRACRAFT AC30	£104.00*
DYNAVECTOR DV505	£225.00*

*Post £1.00; Other Items 30p.

ACCESSORIES

Mayware Stylus Scale	£3.45
Mayware Protractor	£3.45
Shure Stylus Scale	£4.24
Decca Sweep Arm	£5.59
Decca Record Brush	£5.32
Monitor Audio Stylift	£5.99
Record Clamps	
Monitor Audio 'Pod'	£7.50
Yulon Record Clamp	£7.50
Metrosound Clamp	£4.50
A.D.C. LMG-1 Headshell	£4.60
Disk 22 Turntable Mat	£12.99*
G.A. Soundisc	£12.99*
Avon Audiomat	£9.00*
Spectra/Dumpa Mat	£17.95*
Nagaoka Headshell Wires:	
AG99L-Silver Litz	£3.40
Nagaoka RC100 Rolling Record·Cleaner	£7.95
Nagaoka RC200 Cleaner	£10.95
Micro-Sorber Turntable Feet	£9.00
Pixall Roller	£4.45
Pixall Refill	.75
Permostat Kit	£4.95
Permostat Refill	£3.50
Permostat Jumbo Refill	£6.95

*Postage £1.00. Other items 30p.

SOUND CABLES

Monitor Audio Flat Cable	
3.6m. per pair	£14.26
5m. per pair	£17.37
7.5m. per pair	£25.30
10m. per pair	£30.15
Monitor Audio Round Cables	
5m. per pair	£16.25
10m. per pair	£28.37

Q.E.D. See QED Accessories.
Post/packing: £1.00 per order.

HEADPHONES

MICRO-SEIKI	
Micromonitor MX5	£69.95
STAX	
SR44	£59.80
SR5/SRD6SB	£86.63
SRX 3/SRD 6SB	£134.93
LAMBDA/SRD6SB	£153.23
SR SIGMA/SRD6SB	£211.60
SRDX Energiser	£60.00
YAMAHA	
HP1	£35.42
HP2	£26.37
HP3	£19.78
SENNHEISER	
HD 400	£11.70
HD 414X	£19.95
HD 424X	£27.91
HD 224X	£37.52
HD 420	£23.00
HD 430	£33.95
KOSS	
PRO 4AAA	£44.95
K6A	£16.50
K6ALC	£19.95

Post, packing and Insurance £1.00 on all headphones.

CARTRIDGES AND STYLI

Genuine article in Maker's Box. Post 30p

CARTRIDGES WITH STYLI		REPLACEMENT STYLI	
ADC ZLM	£57.14	RSZ	£26.53
ADC XLM III	£36.29	RSX	£18.35
ADC VLM III	£25.04	RSV	£15.08
Decca London Gold	£55.00	—	
Goldring G900E	£15.75	D140E	£9.75
Goldring G900SE	£19.95	D140SE	£15.99
Goldring G900SE II	£31.95	D140SE	£15.99
Goldring G900 'IGC'	£7.95	D140 IGC	£28.95
Grado FCE+1	£13.75	FCE+	£8.25
Grado F3E+	£19.25	F3E+	£11.55
Grado F2+	£29.50	F2/S	£19.50
Grado F1+	£41.25	F1+	£24.75
J.V.C. Z2E	£38.33	Z2E	£19.90
J.V.C. X2	£69.51	X2/X1	£37.50
Nagaoka MP10	£12.00	N-10MP	£5.50
Nagaoka MP11	£14.50	N-11MP	£7.00
Nagaoka MP15	£28.00	N-15MP	£22.00
Nagaoka MP20	£33.00	N-20MP	£25.00
Nagaoka MP30	£42.00	N-30MP	£35.00
Nagaoka MP50	£68.00	N-50MP	£52.00
Ortofon SME 30H	£79.95	L30H	£31.00
Ortofon Concorde 30	£53.20	CL30	£31.00
Ortofon Concorde 20	£39.50	CL20	£23.00
Ortofon Concorde 10	£29.50	CL10	£11.70
Ortofon LM30/30H	£46.70	CL30/L30H	£31.00
Ortofon LM20/20H	£33.90	CL20/L20H	£23.00
Ortofon LM15	£23.75	L15	£15.75
Ortofon LM10	£17.35	CL10	£11.70
Ortofon M20FL Super	£36.50	D20FL Super	£25.00
Ortofon M20E Super	£31.90	D20E Super	£21.00
Ortofon VMS 20E II	£24.95	D20E MkI & II	£17.95
Ortofon F15E II	£18.25	N15E MkI & II	£11.95
Ortofon FF15E II	£12.90	NF15E MkI & II	£8.95
Stanton 881S	£66.55	D81	£33.60
Stanton 681EEE	£36.99	D6800EEE	£18.80
Stanton 680EE	£22.80	D680	£13.99
Stanton 500EE	£15.20	D5100EE	£10.40
Stanton 500E	£13.60	D5100E	£8.80
Stanton 500A	£11.80	D5107A	£6.60
Shure M44-7/C/G	£6.95	N44-7/C/G	£4.35
Shure M44E	£7.72	N44E	£5.26
Shure M55E	£8.40	N55E	£6.29
Shure M75-6S	£7.72	N75-6	£5.26
Shure M75B	£10.32	N75B	£5.88
Shure M75EJ	£12.25	N75EJ	£7.35
Shure M75ED	£14.25	N75ED	£10.50
Shure M95EJ	£12.95	N75EJ	£7.75
Shure M95ED	£19.25	N95ED	£13.75
Shure M95HE	£20.25	N95HE	£14.50
Shure M24H Sp. Offer	£19.95	N24H	£15.95
Shure M97EJ	£2.25	N97EJ	£9.25
Shure M97HE	£32.95	N97HE	£19.25
Shure V15 III	£46.00	VN35E	£15.99
Shure V15 III HE	£51.60	VN35HE	£17.30
Shure V15 IV	£61.30	VN45HE	£21.40
Sonus Gold Series II—Blue	£71.50	Sonus Blue Stylus	£35.78

STYLI FOR OLD MODELS AND FOR 78 R.P.M. (Post 30p)

Goldring G800 Series D110SR £3.50, D110E £6.95, D110SE £10.50, Goldring G820 Series, D130SR £3.60, D130E £7.25, D30SE £7.25, Goldring D110 Std & D130 Std. — 78 r.p.m. £3.50.

Shure: VN15E (V15 II) £14.99; VN78E (V15 III) £15.50; VN78 HE (V15 IV) £21.75; M44-3 (78 for M44-M55) £4.99; N75-3 (78 for M75 & V15 II) £4.99; N95-3 £5.35.

ADC: RXL (XLM II) £12.00; RZL (Super XLM) £18.25; RVL (VLM II) £10.50; R26, £12.50.

Ortofon D15E Super £28.75.

MOVING COIL CARTRIDGES Post 50p

Micro-Seiki LC80-W	£85.00	Satin M117Z	£40.95
Ortofon MC10 Sp.Off.	£39.95	Satin M117ZE	£49.95
Ortofon MC20	£59.95	Satin M117G	£61.50
Ortofon SL20Q Sp.Off.	£69.95	Satin M117S	£98.50
MCA-10 Pre-Amp.	£58.40	Ultimo Karat Ruby	£82.50
MCA-76 Pre-Amp.	£88.68	Ultimo 10X	£49.50
STM 72 T/former	£22.60	Ultimo 20A MkII	£75.00
MC10 + STM72	£58.40	Ultimo 30A	£87.50
Entre 1 Cartridge	P.O.A.	Fidelity Research	
Lentek Pre-Amp.	P.O.A.	FR1 Mk.2	£56.40
Mayware MC-2C	£49.45	FR1 Mk.3F	£81.52
Mayware MC-3L	£49.45	Mayware T24 T'former	£49.45

AUDIO TECHNICA "SAFETY RAISER" AT-6006

Automatic Arm Lift. £9.90 P&P 30p.

TEST RECORDS (P.&P. 65p)

HFS 75, £3.45; Ortofon Direct Cut, £11.00;
Shure TTR115 ERA IV, £5.00; Shure TTR110, £4.25.

CRYSTAL CLEAR DIRECT CUT RECORDS £9.00

(Post Free) Catalogue available.

MOBILE FIDELITY SUPER CUT RECORDS

(Post Free)

Single Albums £14.50. Double Albums £22.00.
List available on request.

T.D.K. HEAD DEMAGNETISER

Cassette Shaped Battery Powered LED Checklight, £8.99. *Post 30p*

Twenty years ago our 'latest' was a moving coil cartri

Today it's a Flux Bridger, the new Grado G2+

The Grado G2+ is one of the finest cartridges produced in the world today. It features the ingenious Flux Bridger system which has been constantly developed to realise new standards of sonic accuracy.

Yet how ironic to think that in 1958 Joseph Grado announced, and patented a stereo moving coil cartridge!

Now over twenty years later, it is the Flux Bridger system, exclusive to Grado, which has been adopted for our 'top of the range' Laboratory Series cartridge.

The Grado G2+ 'Twin Tip' is the result of an evolutionary, rather than revolutionary process, which epitomises our progressive attitude to disc information retrieval.

The development work on this new phono cartridge was preceded by specific information retrieval requirements. In this work Grado collaborated with major recording companies as well as drawing heavily on our own extensive experience.

Our aim was to find the best possible solution to scanning groove modulations without the stylus being modulated by irregularities in the vinyl outside the critical information path.

Result: the Grado G2+ Twin Tip.

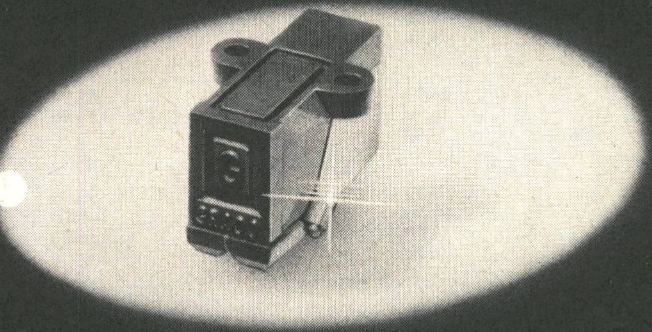
Grado Laboratories' determination to develop the potential of the highly efficient Flux Bridger system can be heard in the exciting Grado G2+. For instance, it employs new ultra-low hysteresis magnetic material for the smoothest possible transfer of electrical energy, and through using fewer coil turns low inductance and an exceptionally wide bandwidth are assured.

It's faster than most. Over the years Grado cartridges have become famous for their realistic sound reproduction. Few cartridges could hope to match the G2+ for its spontaneous transient performance – almost certainly none at the price.

This is due in part to the exclusive Twin Tip stylus which plays a major role in our new cartridge's advance towards tracking perfection. Two minute scanning surfaces meticulously polished to quarter-spheres of only 0.00025″ radii, accurately trace even the very shortest

ge.

Twin Tip.



wavelength modulations, thus achieving an exceptionally smooth and extended high frequency performance.

The design geometry also gave us the opportunity to maximise signal to noise potential by eliminating any tendency for the stylus to 'bottom' in the groove. This was achieved by precise separation of the two points of contact which places the stylus securely in the information path.

What's more, because the scanning surfaces are micro-spheres they are less susceptible to groove alignment inaccuracies or loss of azimuth.

Yet, in spite of the excellent performance of its electro-mechanical system the Grado G2+ is remarkably tolerant. It is insensitive to amplifier input capacitance, and the very desirable combination of low weight and medium compliance guarantees compatibility with a wide range of pick-up arms.

This is a cartridge for the very serious listener. It is expensive, yet the Grado G2+ can reproduce more information than much costlier rivals. Of course, they don't employ the Flux Bridger principle. Twenty years from now though, they just might!

Audition the Grado G2+ Twin Tip.
Twice the cartridge.

For further information write to:
Transonic Imports (Acoustical) Ltd.,
Brooks Court, Stamford, Lincs.

Name ____________________

Address ____________________

____

Grado G2+

COMET HI~FI

LOWEST PRICES - THAT'S A PROMISE

There's no need to shop around before buying at Comet. Our prices are the lowest in the business, we know – we check the competition ourselves. If however, you find that any item you intend buying at Comet is being currently advertised at a lower price elsewhere – let us know and . . .

WE WILL BEAT ANY GENUINE ADVERTISED PRICE - ON THE SPOT

On all brand new current merchandise in stock

STEREO AMPLIFIERS

	Comet Price Inc. VAT
AIWA	
AA8100 2×25	69.94
AA8300 2×45	99.90
AKAI	
AM 2350 2×35	69.90
ALBA	
2025 2×27	59.90
3035 2×30	79.90
2050 2×50	79.90
AMSTRAD	
EX 220 2×25	44.90
EX 330 2×35	54.90
A101/P101 Micro 2×25	74.90
MARANTZ	
1050 2×25	59.94
1040M 2×20	64.90
1072 2×36	64.90
1070M 2×35	89.90
PIONEER	
SA 408 2×20	57.90
SA 508 2×25	79.94
SA 7800 2×65	229.90
SA 8800 2×80	279.90
SA 9800 2×100	366.90
ROTEL	
RA 300 2×20	59.90
RE 700 graphic equaliser	64.90
RA 314 2×25	52.90
RA 350 2×35	69.90
RC1000 pre amplifier inc. graphic equaliser	109.90
RB1000 2×65 power amplifier	109.90
RA1000 2×40 inc. graphic equaliser	109.90
SANSUI	
A40 2×25	65.90
A60 2×45 DC coupled	90.90
A80 2×65 DC coupled	121.90
TRIO	
KA3750 2×25	49.90

TUNERS

	Comet Price Inc. VAT
AIWA	
AT9300 LW/MW/FM	69.90

Tuners—continued

	Comet Price inc. VAT
ALBA	
2000 MW/LW/FM	59.90
3000 MW/LW/FM with 5 FM pre sets	79.90
AMSTRAD	
EX202 MW/LW/FM	39.90
EX 303 MW/LW/FM	47.90
T101 Micro digital MW/LW/FM	69.90
MARANTZ	
2050 MW/FM	53.90
2100 MW/FM	64.94
2060 ML LW/MW/FM	79.90
PIONEER	
TX 408L LW/MW/FM	58.90
TX 7800 MW/FM	168.90
TX 9800 MW/FM	224.90
ROTEL	
RT300 LW/MW/FM	58.90
RT426 MW/FM	49.90
RT1000 LW/MW/FM	89.90
SANSUI	
T60 MW/FM	67.90
T80 MW/FM Digital display	94.90
SOLAVOX	
ST 3002 FM/MW/LW	41.90
TRIO	
KT 5550 MW/FM	49.90

CASSEIVERS

Tuner/Amplifier/Cassette Combinations

	Comet Price inc. VAT
AIWA	
AF3090 2×40 Dolby cassette	269.94
AKAI	
AC3500L 2×25 Dolby cassette	179.94

Casseivers—continued

	Comet Price Inc. VAT
FERGUSON	
3926 2×20 watts RMS 4 waveband with Dolby cassette	139.90
GOODMANS	
4000 2×28 with Dolby cassette inc. pair Goodmans MC35 loudspeakers	219.90
MARANTZ	
4025L 2×25 with Dolby cassette LW/MW/FM	194.90

TUNER/AMPLIFIERS

	Comet Price Inc. VAT
ALBA	
2125 2×27 LW/MW/FM	89.90
2150 2×50 LW/MW/FM	119.90
AMSTRAD	
EX222 2×25	49.90
EX 333 2×30	69.90
MARANTZ	
1535ML 2×30	119.90
PIONEER	
SX980 2×80	362.90
SX1080 2×120	448.90
ROTEL	
RX 300 2×20	79.94
RX 504 2×40	109.90
RX 604 2×50	129.90
RX 1203 2×120	189.90
RX 1603 2×180	239.90
SANSUI	
R30 2×25	91.90
R50 2×45	108.90
R70 2×65	137.90

TURNTABLES

	Comet Price Inc. VAT
AIWA	
AP2100 belt drive auto return, inc. magnetic cartridge	54.90
AP2300 semi-auto direct drive inc. magnetic cartridge	99.90

Turntables—continued

	Comet Price Inc. VAT
AKAI	
APB10C belt drive inc. cartridge	52.50
ALBA	
3002 semi-auto belt drive inc. magnetic cartridge	49.90
AMSTRAD	
TP12D belt drive	25.90
BSR	
P208 belt drive auto fitted ADC QLM33 mag. cartridge	31.90
Quanta 500 belt drive	39.90
Quanta 600 belt drive DC servo, auto return	49.90
Quanta 700 direct drive auto return	59.90
Quanta 800 direct drive quartz locked, auto return	89.90
GARRARD	
SP25 MK.6 belt drive with Shure M75/6/SM	36.90
GT20 belt-drive Shure M75ED	56.90
GT25 belt-drive semi auto M75ED	62.90
MARANTZ	
6025 belt drive	49.90
PIONEER	
PL512 belt drive	49.90
PL200X Direct drive inc. cartridge	79.90
PL300X Quartz locked direct drive auto return inc. cartridge	99.90
PL400X Quartz locked direct drive fully auto inc. cartridge	111.90
ROTEL	
RP1000 Direct drive semi auto	89.90
TRIO	
KD1033B belt drive	49.90

7/80

I promise you *12 months service, including parts and labour on all goods – without charge. After the initial free 12 month period you can still rely on us to keep your purchases in working order.*

Michael Hollingbery
Chairman

SPEAKERS

ALL SPEAKERS
ARE PRICED AS PAIRS

	Comet Price Inc. VAT
AMSTRAD	
ACOUSTRA 1000	19.90
Micro 101	39.90
CELESTION	
Hadleigh	39.90
Ditton 121	68.90
County	87.90
Ditton 15XR	114.90
Ditton 22	154.90
GOODMANS	
RB18	49.90
KLH	
331	94.90
317	134.90
MARANTZ	
4G	54.90
4G3	69.90
HD440	84.90
SANSUI	
J11 Mini	79.90
SOLAVOX	
PR25 MK. II 2 way	39.90
PR35 MK. II 3 way	59.90
PR45 MK. II 3 way	79.90
HS55	97.90
HS70	139.90
WHARFEDALE	
Chevin XP	34.90
Denton XP2	47.90
Shelton XP2	59.90
Linton XP2	78.90
Glendale XP2	104.90
Teesdale SP2	134.90
E20 High power	159.90
E30 High power	199.90
E50 High power	299.90
E70 High power	349.90
E90 High power	499.90

CARTRIDGES

	Comet Price Inc. VAT
AKG	
P7E	24.90
P8E	29.90
AUDIO	
TECHNICA AT11E	6.50
TECHNICA AT13EA	11.90
TECHNICA AT30E Moving coil including AT630 transformer	44.90
GOLDRING	
G800	5.90
G800E	8.90
G800 Super E	11.90
G900E	15.90

Cartridges—continued

	Comet Price Inc. VAT
ORTOFON	
FF15E MK. II	12.90
VMS 20E MK. II	27.90
SL20E Moving coil	29.90
STM72 Transformer for SL20E	16.50
SHURE	
M55E	8.50
M75ED	13.90
M75EJ	12.50
V15-MK. 3	39.90
V15-MK. 4	57.90

Styli

	Comet Price Inc. VAT
AUDIO	
TECHNICA ATS11E (for AT11E)	5.25
TECHNICA ATN13 (for AT13EA)	10.90
GOLDRING	
D110 Stylus (G800)	3.25
D110E Stylus (G800E)	5.90
D110SE Stylus (G800 Super E)	8.45
ORTOFON	
NF15E MK. II for FF15E MK. II	7.90
D20E MK. II for VMS 20E MK. II	17.90
SHURE	
N75/6 Stylus	5.50
N75EJ Stylus	8.50
N75ED Stylus	12.50
N95ED	15.90
VN35E Stylus for V15 Type 3	17.90
VN45HE Stylus for V15 Type 4	23.90

HEADPHONES

	Comet Price Inc. VAT
ALBA	
H5/H6	5.90
AMSTRAD	
HPS 6A	11.50
GOODMANS	
OHP10	14.90
KOSS	
K6	9.90
K6/LC (with volume control	13.90
PRO-4AA	21.90
K125	17.50
K135	20.90
K145	27.50
PIONEER	
SE205	14.90
SE305	19.90

Headphones—continued

	Comet Price Inc. VAT
SANSUI	
SS30	14.90
SOLAVOX	
300	5.90
WHARFEDALE	
1D2	26.90

HI-FI CASSETTE TAPE RECORDERS

	Comet Price Inc. VAT
AIWA	
ADM100 Dolby	79.90
ADM200 Dolby variable bias	124.90
AKAI	
CSM01 Dolby	69.90
CSM02 Dolby with metal tape facility	89.90
GXC704D Dolby	79.90
GXM10 Dolby with metal tape facility	137.90
ALBA	
2200 Dolby	59.90
3300 Dolby with metal tape facility	109.90
AMSTRAD	
EX700 Dolby	69.90
BINATONE	
6764 Dolby	64.90
LLOYTRON	
H522	49.90
MARANTZ	
5050M Dolby	79.90
CD320 Dolby 2 head batt/mains	104.90
CD330 Dolby 3 head batt/mains	124.90
PIONEER	
CTF500 Dolby	88.90
CTF600 Dolby	109.90
CTF650 Dolby metal tape	139.90
CTF750 Dolby auto reverse, metal tape facility	209.90
ROTEL	
RD 25F Dolby variable bias	109.90
RD25FD Dolby variable bias, colour to match 1000 series	109.90
RD 1000 Dolby to match 1000 series	169.90
SANSUI	
D90 Dolby	79.90

HI-FI Cassette Tape Recorders—continued

	Comet Price Inc. VAT
SOLAVOX	
SCD 2070 Dolby	59.90
TRIO	
KX503 Dolby	79.90

OPEN REEL TAPE RECORDERS

	Comet Price Inc. VAT
AKAI	
GX4000D	194.90
PRO 635 auto reverse in RMH 400 rack	549.90
GRUNDIG	
TS 945 4 motor, 3 heads and echo	249.90
TS 1000 Semi-professional electronic switching, 3 heads, 3 motors	399.90
PIONEER	
RT 707 Auto reverse	389.90

MICROPHONES

	Comet Price Inc. VAT
AKAI	
ADM20	7.90
ACM50	8.90
AMSTRAD	
DM701 stereo mic. pack (pair)	13.90
MARANTZ	
Superscope EC1 Electret condenser	5.90
Superscope EC3 Electret condenser	8.90

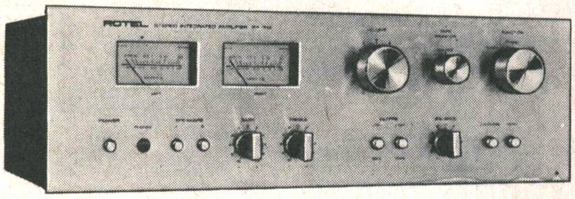
HI-FI FURNITURE

	Comet Price Inc. VAT
ALBA	
ALBA 3001 Rack	39.90
IDEAL	
L20 Hi-Fi Cabinet	29.90
MARANTZ	
MR500	28.90
ROTEL	
RK310/RK300V	39.90
RK1000M	49.90
SANSUI	
GX60 Receiver rack	34.90
GX70 Amplifier rack	44.90
TRIO	
SRC 75 System rack MK.2	37.90

All offers subject to availability.

COMET SUPER BUYS

ROTEL RA314 STEREO AMPLIFIER



Delivering a power output of 25 watts RMS per channel with total harmonic distortion as low as 0.05% at full power, the RA314 is an impressive all-round performer. Circuitry is DC coupled, giving improved bass performance, and an important feature is the inclusion of large, quick-response twin power meters which also serve as 'power-on' indicators. Other features include full tape dubbing in both directions, low and high filters, loudness and mono/stereo buttons, and provision for 2 pairs of speakers.

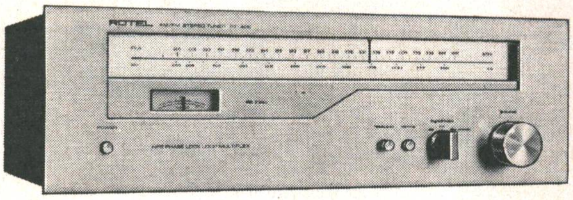
Comet Price £52.90 inc. VAT

TRIO KA3750 STEREO AMPLIFIER

Delivering an output of 25 watts RMS per channel of low distortion power, the KA-3750 is superbly engineered to deliver excellent tonal quality with crisp, clear efficiency at every audible frequency. This no-nonsense amp has an advanced specification which includes direct-coupled low noise phono equaliser, click-stop tone controls and low-boost loudness control.

Comet Price £49.90 inc. VAT

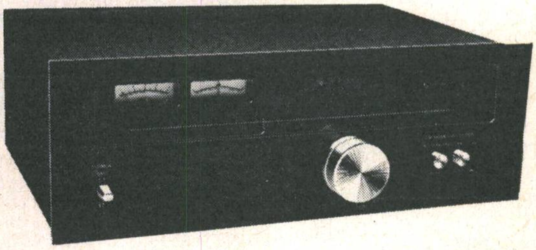
ROTEL RT426 AM/FM TUNER



The RT426 is packed with features to ensure excellent AM/FM reception. And impressive specification includes Negative feedback phase lock loop MPX to pull in marginal programme signals and to give long term stability of stereo separation, low drift and low distortion. A signal meter serves for both FM tuning and signal strength — and buttons for hi-blend and interstation muting are also provided.

Comet Price £49.90 inc. VAT

TRIO KT-5550 STEREO TUNER



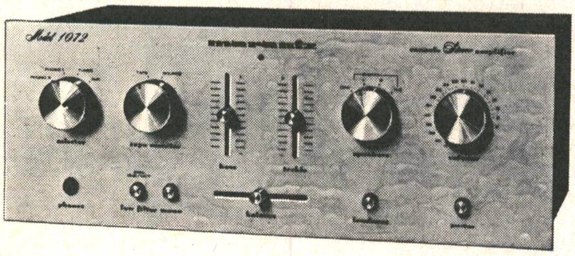
Here is an AM/FM tuner which fully reflects Trio's uncompromising attitude to tonal quality and stereo performance. Even the weakest of FM stations are received very clearly without interference and noise, and an advanced PLL (phase-lock-loop) IC maintains a wide stereo separation. Junction FETs give a high stability, and 65dB of selectivity enables you to choose from stations that are crowded together without overlap distortion.

Comet Price £49.90 inc. VAT

217a

COMET SUPER BUYS

MARANTZ 1072 STEREO AMPLIFIER



With a healthy, low-distortion output of 35 watts RMS per channel, the 1072 is packed with Hi-Fi features. These include: full complementary direct coupled output stage (DC), 41 stepped detented volume control, detented graphic bass and treble tone controls, loudness and mono switches, low filter, tape monitor and provision for operating 2 pairs of speaker systems.

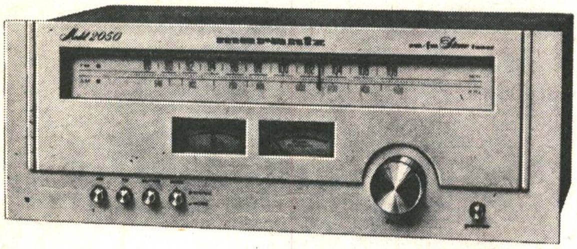
Comet Price £64.90 inc. VAT

GARRARD SP25 MKV TURNTABLE

A super buy — even by our standards — this is the Garrard SP25 Mark V from Comet. Belt-driven by a 4-pole synchronous motor, this elegantly engineered automatic turntable is packed with Hi-Fi features. These include a low mass S-shaped tonearm, precision ball bearing pivots, viscous-damped cueing, and calibrated stylus force and anti-skating adjustment. A Shure M75/6 magnetic cartridge completes this outstanding value-for-money bargain.

Comet Price £34.90 inc. VAT

MARANTZ 2050 AM/FM TUNER



With a specification that includes dual gate MOSFET FM front end circuitry based on ceramic IF filters, and phase locked loop (PLL) demodulator which gives exceptional selectivity as well as optimum FM stereo channel separation, the 2050 is the ideal match for the 1050 amplifier. Other features include: 3 gang FM tuning capacitor, signal strength and centre tuning meters, and mono and FM muting switches.

Comet Price £53.90 inc. VAT

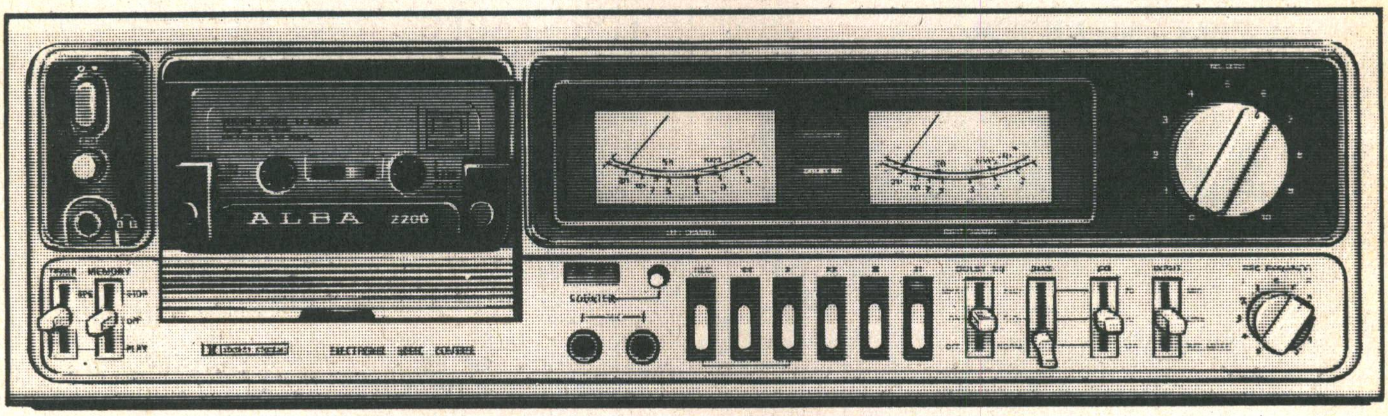
MARANTZ 6025 TURNTABLE

This semi-automatic, belt-drive unit features the revolutionary tonearm design used on every Marantz turntable. Tracking error distortion has been lowered by 30% below that of a conventional tonearm. Other features of this perfectly engineered turntable include: AC synchronous motor, bias control and calibrated counterweight, and automatic return/shut-off.

Comet Price £49.90 inc. VAT

COMET **ALBA**

The ALBA 2200 Cassette Deck



HIGH FIDELITY at an Incredibly Low Price!

Here's a Hi-Fi bargain that's too good to miss . . . a superbly-equipped front-loading Dolby deck at a discount price that's incredibly low, even by Comet standards!

Where else can you get all these impressive high fidelity features in this price bracket? Features like Dolby noise reduction, 3-step bias and equalisation selectors for spot-on tape matching, memory rewind facility, solenoid-assisted buttons for controlling tape movement, large VU meters, record balance control, and a 40-step recording level control. And that's not all! The specification of the 2200 incorporates full auto-stop on all modes — plus a timer switch to give you full facilities for unattended recording and automatic playback in conjunction with a mains timer.

This combination of Alba quality and Comet cut-to-the-bone discount pricing just has to be one of the finest Hi-Fi value-for-money buys ever. Call in now while stocks last.

COMET

Price £59·90

218

COMET

The Complete Hi~Fi Service

All branches are open daily to the public

Monday-Friday 9 a.m.-8 p.m. Saturday 9 a.m.-5.30 p.m. Scottish Branches also open Sundays 10 a.m.-5.30 p.m. (with the exception of branches marked †)

***New Discount Photographic Department now open at all Branches except where starred.**

SCOTLAND

WAREHOUSES

DUNDEE	West Hendersons Wynd	Tel: 0382 28101
EDINBURGH	1 Newhaven Road	Tel: 031-554 4454
GLASGOW	West Lodge Road, Blythswood Trading Estate, Renfrew	Tel: 041 886 5731
GLASGOW	Kilmuir Road, Birkenshaw Industrial Estate, Tannochside, Uddingston	Tel: Uddingston 815134

DISCOUNT SHOPS

ABERDEEN	Constitution Street	Tel: 0224 29434
†AYR	41-43 Dalblair Arcade	Tel: 0292 62284
†DUMFRIES	66 Glasgow Street	Tel: 0387 63958
†DUNFERMLINE	12/14 Chalmers Street	Tel: 0383 35136/7
EDINBURGH	118 Dalry Road, West Haymarket	Tel: 031-346 0191/2
FALKIRK	Howgate	Tel: 0324 34247
GLASGOW	22 Byres Road	Tel: 041-334 4667
†GREENOCK	4 Jamaica Street	Tel: 0475 20261
†KILMARNOCK	30 Grange Street	Tel: 0563 20126
†KIRKCALDY	27/29 High Street	Tel: 0592 68405/6
†PERTH	35-39 George Street	Tel: 0738 36316
STIRLING	Wallace Street	

NORTHERN ENGLAND

WAREHOUSES

BIRKENHEAD	10-22 Hamilton Street	Tel: 051-647 5555
GRIMSBY	389 Victoria Street	Tel: 0472 59623
HULL	Reservoir Road, Clough Road	Tel: 0482 46441
JARROW	56-64 Ellison Street	Tel: 0632 892211
LEEDS	78 Armley Road	Tel: 0532 440551
LIVERPOOL	Sefton Works, Field Lane, Litherland	Tel: 051-928 6688
§MANCHESTER	Marlborough Mill, Poplar Street, Failsworth	Tel: 061-682 6016
NEWCASTLE	Saville Row, (off Northumberland Street)	Tel: 0632 29896
ROCHDALE	Corner of Well i' th' Lane and Queensway	Tel: 0706 50606
SHEFFIELD	The Mill, 1 Loxley Road, Malin Bridge	Tel: 0742 341721
STOCKPORT	Lower Hillgate	Tel: 061-477 2000
STOCKTON	Teesway, Portrack Lane	Tel: 0642 612311
WIGAN	Wharf Mill, Princess Street	Tel: 0942 34741

DISCOUNT SHOPS

ASHTON UNDER LYNE	Clarence Arcade, Stamford Street	Tel: 061-308 4225
BARNSLEY	72 Eldon Street	Tel: 0226 83358/9
BARROW-IN-FURNESS	Rawlinson Street	Tel: 0229 31520/31595
BIRKENHEAD	220 New Chester Road, Lower Tranmere, Nr. Rock Ferry	Tel: 051-647 4427
BLACKBURN	49-51 Darwen Street	Tel: 0254 57813
BOLTON	63-79 Blackburn Road	Tel: 0204 387153/5
BRADFORD	105-107 Manningham Lane	Tel: 0274 35353
BRIDLINGTON	65 The Promenade	Tel: 0262 72050
BURNLEY	38-40 Manchester Road	Tel: 0282 35214
CARLISLE	40-42 Cecil Street	Tel: 0228 38441/2
CHESTER	43-45 St. James Street, off Black Diamond Street	Tel: 0244 313724
CHESTERFIELD	40 St. Mary's Gate	Tel: 0246 71390
CREWE	249/251 Edleston Road	Tel: 0270 214328
DARLINGTON	57 Russell Street	Tel: 0325 57361
DEWSBURY	71 Daisy Hill	Tel: 0924 461203
DONCASTER	17 Market Place	Tel: 0302 69520
DRIFFIELD	30/30a Market Place	Tel: 0377 43277
GOOLE	62/64 Pasture Road	Tel: 0405 3449
HALIFAX	70 Horton Street	Tel: 0422 59434
HARROGATE	16 Parliament Street	Tel: 0423 67312
HORSFORTH	101 New Road Side	Tel: 0532 588679
HUDDERSFIELD	12 Zetland Street	Tel: 0484 40261
HULL	96-104 George Street	Tel: 0482 20681
KEIGHLEY	65 Low Street	Tel: 0535 67021
LANCASTER	9 George Street	Tel: 0524 62904
LEIGH	96 Bradshawgate	Tel: 0942 670711
LIVERPOOL	52 Bold Street	Tel: 051-708 7170
MACCLESFIELD	17A Chestergate	Tel: 0625 610030
MANCHESTER	Deansgate House, 274 Deansgate	Tel: 061-834 1861
MANCHESTER	320-326 Palatine Road, Northenden	Tel: 061-998 1183
PONTEFRACT	Gillygate	Tel: 0977 704249
PRESTON	37 Church Street	Tel: 0772 21909
ROTHERHAM	Canklow Road	Tel: 0709 61901
SCARBOROUGH	8 & 9 York Place	Tel: 0723 75537
SCUNTHORPE	156 High Street	Tel: 0724 69615/6
SOUTHPORT	167 Lord Street	Tel: 0704 31813
ST. HELENS	Kwik Save Centre, Boundary Road	Tel: 0744 35118
SUNDERLAND	4-7 St. Thomas Street	Tel: 0783 59993
*WAKEFIELD	14-16 Marygate	Tel: 0924 71499
WORKINGTON	23A Peter Street	Tel: 0900 63476/7
YORK	55 Piccadilly	Tel: 0904 21654/5

MIDLANDS

WAREHOUSES

BIRMINGHAM	Heeley Road, Selly Oak	Tel: 021-472 6181
BIRMINGHAM	Tivoli Shopping Centre, 1570-1572 Coventry Road, Yardley	Tel: 021-706 0684
LEICESTER	Syston Street	Tel: 0533 52236
NORWICH	Roundtree Way	Tel: 0603 411831
NOTT'HAM/DERBY	121 Town Street, Sandiacre	Tel: 0602 396116
WILLENHALL	Walsall Road	Tel: 0902 60411

DISCOUNT SHOPS

BURTON-ON-TRENT	Bargate Shopping Centre	Tel: 0283 45751/2
DUDLEY	119 Wellington Road	Tel: 0384 214511
GREAT YARMOUTH	137/138 King Street	Tel: 0493 58828/9
HANLEY	52 Town Road	Tel: 0782 264495
KETTERING	93-97 Montagu Street	Tel: 0536 515191
KINGS LYNN	18/20 Railway Road	Tel: 0553 62043/4
LEAMINGTON SPA	39 Bath Street	Tel: 0926 39417
LINCOLN	12-14 Clasketgate	Tel: 0522 37437/8
MANSFIELD	57 Westgate	Tel: 0623 35112
NEWCASTLE UNDER LYME	London Road/Brook Lane	Tel: 0782 626435
NORTHAMPTON	36 Gold Street	Tel: 0604 22151/2
NUNEATON	96/100 Queen's Road	Tel: 0682 387023
*PETERBOROUGH	8 The Hereward Centre	Tel: 0733 46633/46683
SHREWSBURY	7 Barker Street	Tel: 0743 67629
TELFORD	8-10 Tan Bank, Wellington	Tel: 0952 47261/2
WEST BROMWICH	121 High Street	Tel: 021-553 1157/8
WOLVERHAMPTON	41 Exchange Street, Queen's Square	Tel: 0902 21113/4
WORCESTER	4 Wylds Lane	Tel: 0905 356805

LONDON

WAREHOUSES

DAGENHAM	Rainham Road South	Tel: 01-595 5111
HACKBRIDGE (Nr. Croydon)	190 London Road	Tel: 01-669 4321
HAYES (Middlesex)	Silverdale Road, Pump Lane	Tel: 01-573 1841
NEASDEN	The Old Book Centre Building, North Circular Road	Tel: 01-459 8877
POTTERS BAR	Station Close, Darkes Lane	Tel: 0707 43491

DISCOUNT SHOPS

BEXLEYHEATH	288-290 Broadway	Tel: 01-301 1881
BROMLEY	268-272 High Street	Tel: 01-464 0430
CATFORD	80/82 Rushey Green	Tel: 01-690 8611/2
CHELSEA	413/415 Kings Road	Tel: 01-352 4846
HOUNSLOW	10 Staines Road	Tel: 01-572 5013/5023
KINGSTON	35-37 London Road	Tel: 01-549 8799
PUTNEY	278 Upper Richmond Road	Tel: 01-785 9891/2
TOTTENHAM	422 High Road	Tel: 01-801 6777

SOUTH

WAREHOUSES

BRIGHTON	15 Station Street	Tel: 0273 692421/6
EASTLEIGH	Chickenhall Lane	Tel: 0703 614722
NEWHAVEN	Avis Way,	Tel: 07912 5081
OXFORD	Ferry Hinksey Road, Osney Mead	Tel: 0865 48232
READING	Monarch House, 75-81 Caversham Road	Tel: 0734 599911
ROCHESTER	Maidstone Road	Tel: 0634 49171
SOUTHAMPTON	East Street Centre, East Street	Tel: 0703 36944

DISCOUNT SHOPS

AYLESBURY	Unit 2A, Cambridge Close	Tel: 0296 28771/2
BASILDON	High Road, Vange, Pitsea	Tel: 0268 556299/556349
BEDFORD	18/20 St. Peter's Street	Tel: 0234 46625/6
BOURNEMOUTH	210 Old Christchurch Road	Tel: 0202 293334/5
CAMBRIDGE	72/74 Newmarket Road	Tel: 0223 312248
CANTERBURY	Unit 4, Cotton Road, Wincheap Industrial Estate	Tel: 0227 56744
EASTBOURNE	50 Kingfisher Drive, Langney District Shopping Centre	Tel: 0323 766010
FOLKESTONE	26-30 Tontine Street	Tel: 0303 59166/7
GUILDFORD	94 Woodbridge Road	Tel: 0483 38003/4
HASTINGS	389 London Road, St. Leonards-on Sea	Tel: 0424 436462
HIGH WYCOMBE	16 Frogmoor	Tel: 0494 444771/2
IPSWICH	St. Margaret's Green	Tel: 0473 215596/7
LUTON	52-52A Wellington Street	Tel: 0582 414965/419666
PORTSMOUTH	84/90 Palmerston Road, Southsea	Tel: 0705 24666/7/8
SALISBURY	33 Catherine Street	Tel: 0722 24562/3
SLOUGH	264 High Street	Tel: 0753 70535/6
SOUTHEND	817-821 London Road, Westcliff-on-Sea	Tel: 0702 715151
STEVENAGE	14 Queensway	Tel: 0438 66545/6
SWINDON	73-75 Cricklade Road	Tel: 0793 41606/7
TUNBRIDGE WELLS	41 Mount Pleasant Road	Tel: 0892 41477
WATFORD	78 Queens Road	Tel: 0923 21311/2
WEYMOUTH	54 St. Thomas Street	Tel: 030 57 74711
WOKING	6/7 High Street	Tel: 048 62 20026

WALES AND SOUTH WEST

WAREHOUSES

BRISTOL	Barton Hill Trading Estate	Tel: 0272 559841
CLEVEDON	4-9 Kimberley Road, (off Strode Road),	Tel: 0272 876041
NEWPORT	Maesglas Industrial Estate	Tel: 0633 50431
PLYMOUTH	119 Mayflower Street	Tel: 0752 29501

DISCOUNT SHOPS

BATH	Unit 2, Ham Gardens	Tel: 0225 64302/3
BRISTOL	16a St. Thomas Street	Tel: 0272 293395/6
CARDIFF	558 Cowbridge Road East	Tel: 0222 566138/9
CHELTENHAM	16-22 St. James Street	Tel: 0242 25786
EXETER	Summerland Street	Tel: 0392 76435
GLOUCESTER	Morroway House, Station Road	Tel: 0452 411233
HEREFORD	65 St. Owen Street	Tel: 0432 59259
SWANSEA	218 High Street	Tel: 0792 41094
TAUNTON	45 St. James Street	Tel: 0823 86116/7
TORQUAY	184 Higher Union Street	Tel: 0803 211581/2
WREXHAM	20-26 Brook Street	Tel: 0978 57115

CHANNEL ISLANDS

Prices are as those operating in the U.K. less V.A.T. but with a small island transportation charge included

*GUERNSEY	Charroterie Mills, St. Peter Port	Tel: 0481 27141
*JERSEY	9 Commercial Buildings, St. Helier	Tel: 0534 72501

§Closed all day Monday

ORDERING BY MAIL

Send your requirements to the Comet Warehouse listed below, including the appropriate delivery charge in your cheque or postal order, made payable to "COMET". If buying on ACCESS, BARCLAYCARD or COMET CREDIT CARD include your card number and mark your order "ACCESS/BARCLAYCARD/ COMET CREDIT CARD".

MAIL ORDERS TO BE SENT TO:
Comet Discount Warehouse, 78 Armley Road, **LEEDS** LS12 2EF.

Postage and Packing (per item): Cartridges 50p; Headphones £1; Pick-up Arms £1; Headshells 30p; Blank tapes — per order, irrespective of quantity, Spool tapes 50p; Cassettes 30p; Microphones 75p.

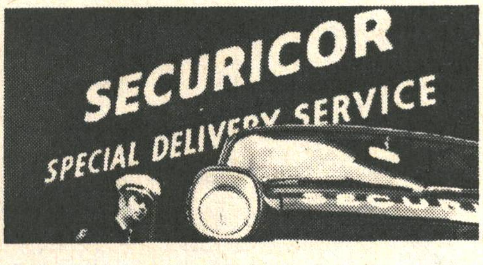
ORDERING BY PHONE

For telephone orders simply 'phone your nearest Comet branch and pay the driver on delivery. Comet also offer an extra service for all ACCESS, BARCLAYCARD or COMET CREDIT CARD holders. Simply 'phone Leeds 0532 440551, ask for Credit Mail Order, stating your card number with your order. You can leave the rest to us!

CREDIT FACILITIES

on Comet Discount Prices.
(AVAILABLE ON MAINLAND ENGLAND, SCOTLAND AND WALES)

Any item or number of items whose total value exceeds £70 can be purchased on Credit on Comet's discounted prices over 12, 24 and 30 months. Send your requirements to the Mail Order Department marked "Credit Mail Order" and we will send you by return of post an application form and details of our repayment terms — all entirely without obligation.



Securicor Delivery All stock items will be delivered by Securicor (mainland U.K. only). Please add £4.50 to your order for this service.
All goods are fully insured against loss or damage whilst in transit.

Ask for details of the new Comet Credit Card.

COMET
CREDIT CARD
12345678
A. CUSTOMER
Expiry Date MAY 89

Buy it with Access

VISA

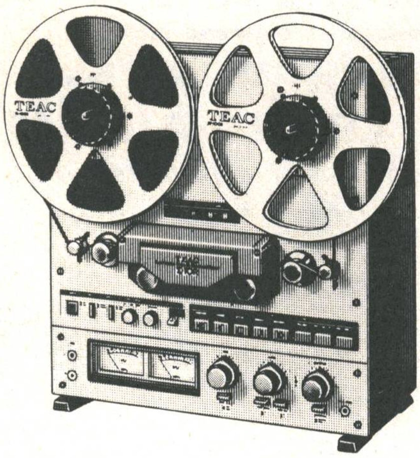
Order by Mail or Telephone **Leeds** 0532 440551.
using ACCESS, BARCLAYCARD or COMET CREDIT CARD.

All prices quoted in Comet's Advertisements are correct at time of going to press.

COMET DISCOUNT WAREHOUSE
Mail Order Department, 78 Armley Road, Leeds LS12 2EF.

These facilities are also available to personal callers at all branches; no deposit credit terms over 9 months, goods delivered on first month's payment in advance.

7/80



Consultancy

In any civilised society, there must be a natural tendency to strive for excellence – for what truly represents a pinnacle in all respects; that defines the barriers between the "best" and the rest . . .

Subjective Audio are representative of this attitude, our selection being deliberately limited to the cream of the world Hi Fi.

Our approach is to investigate and evaluate the many alternatives available and use the results imaginatively. We could have chosen recording equipment from no end of suppliers – we didn't. We chose TEAC.

TEAC because of their strict adherance to sound reproduction in the home, where it's designed to be heard. Magnificent in performance and construction, the equipment is as near 100% reliable as we have ever experienced. TEAC is the best recording equipment SUBJECTIVE AUDIO can offer.

Consultancy is interpretation of a client's requirements. The very personal nature of Subjective Audio makes it necessary for an appointments system – so please write or phone for a mutually convenient private consultation.

Specialists in the following:–
Meridian, Orpheus, A&R (Cambs), TVA/Valve, Monogram, Trio Technology, Linn, JBE, STD, Michell Eng', Ariston, Gale, Swallow, JBL, Harbeth, Quad, Spendor, Nightingale, SKS, Dynavector, Supex, Asak, Koetsu, Syrinx, Ittock, SME, Hadcock, Blak Audio Tuner, Entre etc., etc.

SUBJECTIVE AUDIO
HI-FI CONSULTANTS

59, Grovelands Road, Palmers Green,
London N.13. Telephone: 01-886 7289
and
The Old School, St Ann's Lane,
Godmanchester, Nr. Huntingdon,
Cambs. Telephone: (0480) 59910

DARBY'S & REVOX

present

A REVOX SERVICE CLINIC

on

friday July 18th and saturday July 19th

at

LOCKEY HOUSE, ST. PETER'S STREET, ST. ALBANS, HERTS.

free SPECIFICATION CHECK ON ANY OF YOUR **REVOX** HI-FI EQUIPMENT.

DEMONSTRATIONS OF ALL THE LATEST **REVOX** PRODUCTS, INCLUDING . . .

. . . . . . THE **TRITON** LOUDSPEAKER SYSTEM

FOR FURTHER DETAILS TELEPHONE andy snipper ON (56) 50961.

"PROFESSIONALISM WITH A SENSE OF STYLE" . . . .

PLANET HI-FI + VIDEO

NEVER AGAIN AT THESE PRICES!

YAMAHA

BARGAINS

CR620 Receiver	£169.00
CR820 Receiver	£199.95
CR1020 Receiver	£245.00
CR2020 Receiver	£295.00

(Carriage and insurance add £5 per item)
Full two year guarantee.

Service is our keynote and has been since we were founded in the 1950's. Expert guidance from qualified staff. We guarantee to provide parts and labour absolutely free of charge for 12 months on any item.
We only sell equipment that we consider to be reliable and backed by reputable manufacturers. All prices quoted are for cash or cheques backed by a cheque card.
Prices correct at time of preparation, subject to change without notice.

BARCLAYCARD VISA

order by phone 01-952 3238

All prices include VAT @ 15%.
Please add £3.00 per item towards carriage and insurance (cartridges and styli post 75p).

Demonstrations, expert guidance and after sales service.

Speakers

SPEAKERS Complete

Aiwa Mini SCEII (pair)	£69.00
Akai Mini SW7 (pair)	£72.00
Celestion Ditton 121 (pair)	P.O.A.
Celestion County (pair)	P.O.A.
Celestion Ditton 15XR (pair)	P.O.A.
Celestion Ditton 22 (pair)	P.O.A.
Celestion Ditton 332 (pair)	P.O.A.
Celestion Ditton 442 (pair)	P.O.A.
Celestion Ditton 551 (pair)	P.O.A.
Celestion Ditton 662 (pair)	P.O.A.
Harbeth H.L. Monitor Mk2	P.O.A.
IMF Electronics all models	P.O.A.
Jordans-Watts Janet (pair)	£69.00
Jordan-Watts Juno (pair)	£90.00
Jordan-Watts GT (pair)	£125.00

KEF Celeste III
KEF Corelli
KEF Calinda
KEF Concord III
KEF Cantata
KEF Model 101
KEF Model 104AB
KEF Model 105 Series II

All normally in stock. Prices on application

JR149 (pair)	£128.50
JR Super Woofer	P.O.A.
Mordaunt-Short Carnival 2	P.O.A.
Mordaunt-Short Festival 2	P.O.A.
Mordaunt-Short Pageant 2	P.O.A.
RAM	P.O.A.
Spendor BC1 Mk II	P.O.A.

SPEAKERS Kits & Units

Jordan-Watts Module	£25.00
Jordan-Watts HF Unit	£10.75
KEF 104 AB Kit	£130.00
KEF Cantata Kit	£208.00
KEF DN22 104AB Convert Kit	£40.00
KEF T27	£8.95
KEF B110	£11.50
KEF B200	£12.75
KEF B139	£26.50
KEF DN12 (T27/B110/B139)	£7.75
KEF DN13 (T27/B200)	£5.50

Amplifiers

ADC SS1 Soundshaper	£61.00
ADC SS2 Mk II Soundshaper	£137.50
ADC SLM 2 Meter	£40.75
Armstrong 621	£122.50
Hitachi HA4500S	£112.50
Hitachi HA5700S	£170.00
Pioneer SA408	£59.50
Pioneer SA508	£94.00
Pioneer SA608	£128.50
Pioneer SA708	£169.50
Pioneer SA7800	£239.50
Pioneer SA8800	£282.50
Pioneer SA9800	£367.50
Quad 33/44/303/405	P.O.A.
Sansui AU217 Mk II	£109.95
Sansui AU317 Mk II	£166.95
Sansui AU417	£210.00
Sansui AU719	£310.00
Sansui A40	£69.00
Sansui A60	£99.00
Sansui A80	£129.00
Yamaha A450/A550/A1	P.O.A.

Receivers

Aiwa AX7300	£104.00
Aiwa AX7700	£164.00
Aiwa AX7800	£264.50
Akai AA1125	£109.00
Akai AA1135	£125.00
Akai AC3500L Cass./Rec.	£185.00
Armstrong 625 FM	£193.50
Armstrong 626 AM/FM	£222.50
Hitachi	P.O.A.
Pioneer SX590	£99.50
Pioneer SX690	£129.50
Pioneer SX790	£203.00
Pioneer SX890	£264.00
Pioneer SX980	£298.00
Pioneer SX1080	£449.50
Pioneer SX1980	£735.00
Rotel RX203L	£98.00
Sansui R50	£119.00
Sansui R70	£155.00
Tandberg TR2045, 2060L, 2080	P.O.A.
Yamaha CR220	P.O.A.
Yamaha CR420	P.O.A.
Yamaha CR620	£169.00
Yamaha CR820	£199.95
Yamaha CR1020	£245.00
Yamaha CR2020	£295.00
Yamaha MS6 Music Centre	£255.00
Yamaha MS8 Music Centre	£315.00

Tape Decks & Recorders

Aiwa ADM200	£120.00
Aiwa AD2000 Dolby	£99.95
Aiwa ADL40 Dolby/Met.	£159.00
Aiwa AD6700 Dol./Met./Rem	£269.00
Aiwa ADM600 Dol./Met.	£175.00
Aiwa ADM700 Dol/3H/Met	£220.00
Aiwa AD6900 Mk II Dolby/3H/Rem/Met	£385.00
Akai GX4000D Reel/3H	£219.50
Akai GX4000DB Reel/Dol	£259.00
Akai CS703D Dolby	£94.50
Akai GXC704D Dolby	£125.50
Akai GXM10 Dol/Met	£138.00
Akai GXM30 Dol/Met	£156.00
Akai GXM50 Dol/3H/Met	£224.50
Akai GXF80 Dol/3H/Met	£299.50
Akai GXF90 Dol/3H/Met	£359.50
Hitachi D40S	£115.00
Hitachi D75S	£170.00
Nakamichi	P.O.A.
Pioneer CTF500 Dolby	£89.00
Pioneer CTF600 Dolby	£109.00
Pioneer CTF650 Dolby/Met	£171.95
Pioneer CTF750 Dol/Met/Rev	£213.95
Pioneer CTF850 Dolby/3H/Met	£233.95
Pioneer CF950 Dolby/3H/Met	£333.95
Pioneer CTF1250 Dolby/3H/Met	£458.95
Sansui D90	£89.00
Sansui D100 Met	£114.00
Tandberg TD20A Reel	P.O.A.
Tandberg TCD420A	P.O.A.
Tandberg TCD440A Dol/3H/Met	P.O.A.
Yamaha K350	P.O.A.
Yamaha K850	P.O.A.
Yamaha K950	P.O.A.

Pick-Up Arms. Cartridges & Styli

ADC LMG1 Headshell	£5.00
Formula 4 Mk III	£49.45
SME 3009 Improved	£57.00
SME 3009 S2	£62.50
SME 3009 Mk III	£107.00
SME FD200 Damper	£18.75

CARTRIDGES

	Price	Styli
*ADC QLM36 3 Imp	£17.50	P.O.A.
*ADC VLM 3 Imp	£25.00	£19.00
*ADC XLM 8 Imp	£36.75	£23.00
*ADC ZLM Imp	£59.50	£33.50
Goldring D110 (Styli for G800)		£4.00
Mayware M/C 2C	£49.45	—
Mayware T24 Trans	£49.45	—
Mayware M/C 3L	£49.45	—
Ortofon FF15E2	£15.00	P.O.A.
Ortofon F15E2	£22.00	P.O.A.
Ortofon VMS20E II	£32.50	P.O.A.
Shure M44/7	£8.25	£6.00
Shure M55/E	£9.50	£7.50
Shure M75/EJ2	£13.50	£10.00
Shure M75/ED2	£16.00	£13.75
Shure M95/HE	£21.00	£17.50
Shure V15/3HE	£54.00	£21.50
Shure V15/4	£66.00	£29.50
Shure N75/6 (Styli)	—	£7.00
Shure N93/E (Styli)	—	£10.50

*With Free LMG1 Headshell.

Headphones

Pioneer SE205	£12.75
Pioneer SE305	£19.50
Pioneer SE505	£40.00
Pioneer Monitor 10	£38.00
Yamaha HP1	£35.00
Yamaha HP2	£26.00
Yamaha HP3	£19.50

Turntables

ADC 1700DD/XLM	£111.50
Akai AP206	£85.00
Aiwa AP2400	£113.00
Aiwa AP2600	£135.00
Garrard SP25/6 M75-6	£46.00
Hitachi HT356	£98.00
Linn Sondek LP12	P.O.A.
Pioneer PL512	£49.50
Pioneer PL200X	£89.50
Pioneer PL300X	£112.00
Pioneer PL400X	£132.00
Pioneer PL600X	£204.00
Pioneer PLL1000	£409.50
Sansui SR222 Mk II	£68.00
Thorens TD160BC Mk II	£98.00
Thorens TD160 Super	P.O.A.
Thorens TD104	£86.95
Thorens TD105	£104.50
Thorens TD126BC Mk III	£192.00

Systems

Aiwa Micro Compo	£350.00
Akai Pro Pioneer Mini 3000 Pioneer X33/55/77/99 Systems	P.O.A. ALL STOCK

Tuners

Armstrong 623	£137.00
Armstrong 624	£106.00
Hitachi FT4000L	£89.75
Hitachi FT5000	£143.00
Hitachi FT8000	£206.00
Pioneer TX408L	£59.50
Pioneer TX608L	£94.50
Pioneer TX7800	£172.50
Pioneer TX9800	£225.00
Pioneer TXD1000	£254.50
Quad FM3	P.O.A.
Sansui T60	£69.00
Sansui T80	£99.75
Sansui TU217	£105.00
Sansui TU417	£149.00
Sansui TU719	£225.00
Yamaha T550/T1/T2	P.O.A.

maxell TAPE BARGAINS

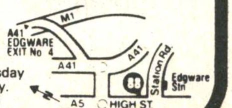
UL60	80p
UL90	99p
UDXL1 C90	£1.83
UDXL2 C60	£1.45
UDXL2 C90	£1.83
MX60 C60 Metal	£3.35

JUST ARRIVED — VHS VIDEO TAPE

7" UD Reel	£4.30
7" UDXL Reel	£5.40
10½" UDXL Reel	£12.40

88 High St., Edgware,
Middlesex, HA8 7HE
Telephone: 01-952 3238
Close to the M1 Motorway

OPEN:
9.30 to 6
Mon. to Sat.
except Thursday
closed all day.
Easy parking
(at rear)



The only thing we discount is the price.

- **CREDIT FACILITIES** (SAME DAY POSSIBLE)
- **AFTER SALES SERVICE**
- **MAIL ORDER**
- **EXPORT**

Please include post and packing
(Send large S A E for brochure and enquiries)
All prices include VAT at 15% and are subject
to alteration due to Manufacturers increases.

BARCLAYCARD Access Barclaycard accepted Access

M.O'BRIEN

HI-FI·TV·VIDEO DISCOUNTS

01 946 1528/0331

95 High Street
Wimbledon Village
London S.W.19

93 Bus route
Open 9.00 am 5.30 pm
Tuesday/Saturday
Closed all day Monday
Prices correct at time of going to press and subject to variation

CASSETTE (CD)/TAPE RECORDERS (TR)

(P & P £2.75)

Aiwa AD6350	£148.00	Nakamichi	P.O.R.
Aiwa AD2000	£148.00	Neal	P.O.R.
Aiwa AD6400	£169.00	Pioneer CTF800	P.O.R.
ADM200	£114.00	Pioneer CT606	P.O.R.
ADM100	£80.00	Pioneer CTF500	P.O.R.
AD6600	£179.00	Pioneer CTF600	P.O.R.
Akai 706D	£125.00	Pioneer CTF650	P.O.R.
Akai CS703D	£75.00	Rotel RD18F	£99.00
Akai GXC4000D	£215.00	Rotel RD25F	£99.00
Akai GX4000DB	£252.00	Rotel RD300	£79.00
Akai 1722 2	£179.00	Rotel RD1000	£169.00
Akai GX704	£110.00	Revox	P.O.R.
Dual	P.O.R.	Sansui New Models	P.O.R.
Ferrograph	P.O.R.	Sony TCK4A	P.O.R.
Hitachi D220	£99.00	Sony TCK5	P.O.R.
Hitachi D560	£159.00	Sony TC399	P.O.R.
Hitachi D850	£231.00	Tandberg	P.O.R.
JVC 1635/2	£203.00	Teac	P.O.R.
JVC	P.O.R.	Yamaha TC520	P.O.R.
Marantz	P.O.R.		

HEADPHONES

(P & P £1.75)

Koss PRO4AAA	£44.00	Sansui	P.O.R.
Koss K6LCA	£16.50	Stax SR5	£87.00
Koss K6A	£15.95	Sennheiser HD414	£18.50
Pioneer SE505	P.O.R.	Sennheiser HD420	P.O.R.
Pioneer SE205	P.O.R.	Sennheiser HD400	P.O.R.
Pioneer SE305	P.O.R.		

TURNTABLES

(P & P £2.75)

Akai AP100	£62.00	Lux	P.O.R.
Akai APB10C	£54.00	Marantz	P.O.R.
Akai APB20C	£69.00	Michell	P.O.R.
Akai AP206	£86.00	Pioneer PL512	P.O.R.
ADC 1500/Q34	£67.00	Pioneer PL200X	P.O.R.
ADC 1600/Q36	£86.00	Pioneer PL300X	P.O.R.
ADC1170	£107.00	Rotel RP2300	£102.90
B & O	P.O.R.	Rotel RP300	£84.00
Connoisseur BD1 Kit	P.O.R.	Rotel RP6400	£99.00
Connoisseur BD101	P.O.R.	Rotel RP9400	£149.00
Connoisseur BD101/ SAU4	P.O.R.	Rotel RP1000	£89.00
		Sansui SR222/2	£63.00
BD2 Chassis	P.O.R.	Sansui New Models	P.O.R.
BD2 P & C	P.O.R.	Sony PST1	P.O.R.
Dual	P.O.R.	Sony PST20	P.O.R.
Garrard SP25/M75/6	£47.00	Thorens TD160BC	£95.00
Garrard GT20 (M75ED)	£67.00	Thorens TD115	£139.00
Garrard GT25 (M75ED)	£73.00	Thorens TD126B/C	£208.00
Garrard GT35 (M75ED)	£86.00	Thorens TD104	£89.00
Garrard DD130 (M75ED)	£93.00	Thorens TD105	£108.00
Garrard DD131 (M75ED)	£99.00	Trio KD1033B	£49.00
Garrard DD132 (M75ED)	£109.00	Trio KD1500	£59.00
Hitachi PS48	£96.00	Trio 2070	£85.00
JVC	P.O.R.	Yamaha YPV2	P.O.R.
JVC QL2/QL4	P.O.R.		

CARTRIDGES (C)/STYLI (S)

(P & P £1.20)

AKG P8ES	£57.00	£36.00	**DECCA GOLD**	£61.00	P.O.R.
P7E	£28.00	P.O.R.	**EMPIRE**		
AUDIO TECHNICA			2000E/11	P.O.R.	P.O.R.
AT15SA	P.O.R.	P.O.R.	**GOLDRING**		
AT14SA	P.O.R.	P.O.R.	G800	£6.88	£4.50
ADC XLM/3	£38.00	P.O.R.	G850	£5.00	£3.00
VLM/3	£28.00	P.O.R.	G800E	£11.00	£8.00
Q36/3	£18.40	P.O.R.	G800SE	£19.00	£11.71
ZLM	£56.00		**JVC** XI	P.O.R.	—

CARTRIDGES (C) /STYLI (S)

MAYWARE	P.O.R.	P.O.R.
ORTOFON		
VMS20E/2	£26.00	—
F15E/2	£19.00	
FF15E/2	£13.00	£10.40
M20E Super	£34.00	P.O.R.
FF15XE	£12.00	P.O.R.
PICKERING		
V15/AME3	£19.50	£16.50
P/ATE	£12.30	£7.00
P/AC	£8.20	£6.00
SHURE		
M3D	£7.30	£5.25
M55E	£9.70	£8.75
M44E	£9.80	£7.00
M75/6	£15.00	£8.00
M75G	£16.00	£9.90
M75/ED	£15.50	£14.00
M75EJ/2	£14.20	£10.30
M95ED	£20.00	£17.20
V15/3	£47.00	£21.00
V15 Mk4	£67.00	£35.00
STANTON		
681EE	£48.00	£28.00
680EE	£31.00	£28.00
680EE	£31.00	£21.00
500EE	£23.00	
ULTIMO 20B	£91.00	P.O.R.
20A	£70.00	P.O.R.
10A/X	£54.00	P.O.R.
20C	£107.00	P.O.R.

AMPLIFIERS

(P & P £2.50 each)

Akai AM2250	£69.00
Akai AM2350	£119.00
Akai AM2650	£185.00
Armstrong 621	£121.00
ADC SS/1	£63.00
ADC SS/2	£140.00
Cambridge	P.O.R.
Hitachi HA250	£80.00
Hitachi HA330	£115.00
JVC JAS11G	£85.00
Lux	P.O.R.
Marantz	P.O.R.
Pioneer SA608	P.O.R.
Pioneer SA708	P.O.R.
Quad 33/303/405	P.O.R.
Radford	P.O.R.
Revox	P.O.R.
Rogers	P.O.R.
Rotel RE700	£69.00
Rotel RA714	£109.00
Rotel RA414	£79.00
Rotel RA314	£79.00
Rotel RA1000	£109.00
Rotel RB1000	£109.00
Rotel RC1000	£109.00
Rotel RA300	£59.90
Rotel RA350	£79.90
Sansui AU217/2	£110.00
Sansui AU317/2	£165.00
Sansui AU417/2	£199.00
Sansui New Models	P.O.R.
Sugden A48/2	P.O.R.
Sony	P.O.R.
Teac	P.O.R.
Technics	P.O.R.
Trio KA3700	£75.00
Trio KA1500	£79.00
Yamaha	£105.00

TUNERS (T)/RECEIVERS (R)

(P & P £2.50)

Akai AA1125	£109.00	Rotel RX304	£109.00
Akai AA1150	£169.00	Rotel RX404	£115.00
Akai AT2450L	£142.00	Rotel RX504	£129.00
Akai AT2250L	£85.00	Rotel RX604	£145.00
Armstrong 625	£185.00	Rotel RT226	£66.00
Armstrong 626	£213.00	Rotel RT726	£101.00
Armstrong 623	£132.00	Rotel RT426	£74.00
Armstrong 624	£102.00	Rotel RT1000	£89.00
Goodmans	P.O.R.	Sansui	P.O.R.
Hitachi SR503L	£140.00	Sansui TU217	£107.00
Hitachi FT340	£90.00	Sansui TU317	£118.00
Harman Kardon	P.O.R.	Sansui New Models	P.O.R.
JVC	P.O.R.	Sugden	P.O.R.
Lux	P.O.R.	Sony STRVL	P.O.R.
Marantz	P.O.R.	Sony ST515L	P.O.R.
Pioneer SX790	P.O.R.	Sony STA3L	P.O.R.
Pioneer SX590	P.O.R.	Tandberg	P.O.R.
Pioneer SX690	P.O.R.	Toshiba	P.O.R.
Pioneer TX606	P.O.R.	Trio 3090	£129.00
Pioneer TX608	P.O.R.	Tunsgram 3535	P.O.R.
Revox	P.O.R.	Yamaha	P.O.R.
Rotel RX1000	£139.00		

MUSIC CENTRES (MC) CASSEIVERS (CR)

(P & P £3.50)

Akai AC3800L	£387.00	Sony HMK80 Dolby	£359.00
Aiwa AF3070	£239.00	Goodmans	P.O.R.
Aiwa AF5300	£341.00	National SG5070	£375.00
Toshiba	P.O.R.	JVC 33 Dolby	£250.00
Sanyo	P.O.R.	Hitachi	P.O.R.

SPEAKERS (SP)/KITS (K)/UNITS (U)

(P & P £2.75)

Armstrong 602	£179.00	KEF DN13	£7.30
Acoustic Research	P.O.R.	KEF Concorde III	£167.00
Cambridge	P.O.R.	Monitor Audio	P.O.R.
Celestion UL6	£139.00	Mordaunt Short	P.O.R.
Celestion UL8	£169.00	Richard Allan RA Series	P.O.R.
Ditton 22	£147.00		
Ditton 33	£189.00	Richard Allan Kits Triple 8	£53.00
Ditton 15XR	£111.00		
Chartwell	P.O.R.	Twin	£35.00
Goodmans	P.O.R.	S/Triple Assembly	£77.00
IMF	P.O.R.	Rogers BBC Monitors	P.O.R.
Jordan Watts	P.O.R.		
KEF Celeste	£100.00	Tannoy	P.O.R.
KEF Corelli	£148.00	Wharfedale	
KEF 104AB	£273.00	Denton XP2	£51.00
KEF Calinda	£226.00	Linton XP2	£81.00
KEF B200	£12.75	Glendale XP2	£104.00
KEF B139	£28.50	Teasdale	£137.00
KEF T27	£8.70	Glendale kits XP2	£66.00
KEF 101	P.O.R.	Linton kits XP2	£46.00
KEF B110	£11.20		

PICK-UP ARMS

(P & P £1.75)

ADC ALT1	£33.00	Mayware	P.O.R.
ADC LMF1	£61.00	SME 3009/ND	£56.00
A/Technica 1005	£38.00	SME FD200 Damper	£26.50
Connoisseur SAU2	£20.00	SME 3009S2	£60.00
Connoisseur SAU4	£46.00	SME Series 3	£97.00
Decca (Inter)	£51.00	SME Series 3/S	£75.00
Hadcock	P.O.R.		

CLEARANCE BARGAINS & SPECIAL OFFERS

LIMITED QUANTITIES

AKAI

1722	£179.00

AIWA

Micro System	£359.00
AF5600	£399.00

B&O

Beocentre 4600	£405.00
Beocentre 4000	£399.00

GOODMANS

MOD80 (F/N)	£89.00

HITACHI

D560	£119.00
D580	£145.00
HA330	£99.00

JVC

KD25	£135.00
JLF50	£89.00
KD2	£140.00

MARANTZ

2100	£79.00

MICRO-SEIKI

DQX500	£228.00
MB10	£59.00
MB14	£69.00
DD20	£110.00

PIONEER

SA706	£129.00
SA606	£102.00

SONY

TAF212	£45.00

TANDBERG

TR2055	£179.00
TR2025	£250.00

TEAC

A105S	£120.00

TECHNICS

SL200	£59.00
RSM56	£229.00
RSM33	£169.00
SH8022	£115.00
RS276 S/H	£131.00
RS7500 (new)	£230.00
SA5460	£169.00

TRIO

KA305	£89.00
KR2010L	£99.00
KR3090	£129.00
KD2070	£86.00

(EX DEMONSTRATION, SHOP SOILED OR SECONDHAND)

KJ Leisure Sound

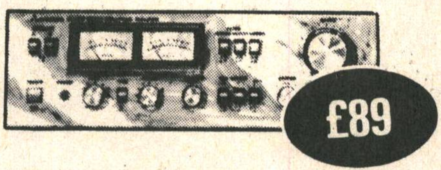
EXCLUSIVE PURCHASES

MITSUBISHI END-OF-LINE

A massive purchase of the last remaining stocks of this superbly engineered, high performance equipment offered at an unrepeatable price. You must know about Mitsubishi they make 'Colt' cars, power stations, ships and some of the best colour TV in the world.

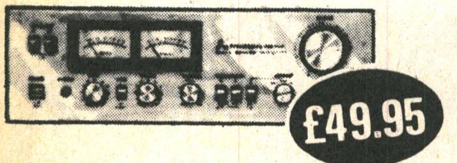
£95

MITSUBISHI DAR 210L RECEIVER
25 watts per channel. FM/MW/LW reception, outputs for 2 pairs speakers and headphones, 2 tape monitor positions and mic'. input.
Previous KJ Price £154.



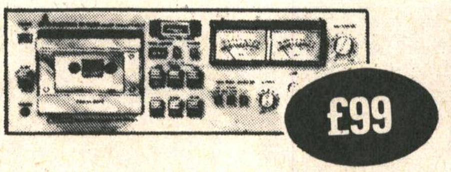
£89

MITSUBISHI DAU 310 AMPLIFIER
50 watts per channel. 2 tape monitor positions allows dubbing, mic' input, loudness control, outputs for 2 pairs speakers and headphones.
KJ Price last year £159.90.



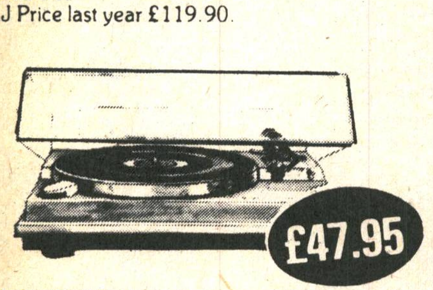
£49.95

MITSUBISHI DAU 210 AMPLIFIER
25 watts per channel, all facilities as for DAU 310.
KJ Price last year £119.90.



£99

MITSUBISHI DT4700S CASSETTE DECK
Dolby, variable output, twin VU meters, separate channel controls on both mic' and line inputs, master fade control, memory plus all usual features.
KJ Price last year £159.90.



£47.95

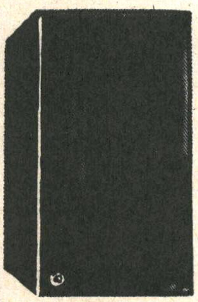
MITSUBISHI DP210 TURNTABLE
Belt drive two speed unit with auto arm return. 12" platter, synchronous motor, damped arm cueing and fitted with cartridge.
KJ Price last year £95.

SYSTEMS

These amazing Mitsubishi prices offer system opportunities from as little as £155 for amplifier, turntable and a pair of speakers or a receiver based system for under £200.

FROM £155

MAIL-ORDER – Carriage and insurance £4.50 per item (£5 on Bolivar speakers). Credit card orders acccepted by telephone – ring your nearest branch to place your order.



BOLIVAR 125 SPEAKERS

£89 99 per pair

This superb punchy, exciting speaker system which received a HI-FI CHOICE 'recommended' rating is offered exclusively by KJ only while stocks last. Finished in hickory and with a cabinet size 22¾" (h) x 12½" (w) x 11" (d).
Previous KJ Price £109.

HITACHI

£229

HMA 7500 MOS FET POWER AMPLIFIER
Minimum 75 watts per channel guaranteed. Distortion 0.01%, response 20Hz – 20kHz, twin power meters, outputs for 2 pairs speakers. Fantastic reviews.
Best ever KJ Price was £377.

£159

HCA 8300 DYNAHARMONY PRE AMPLIFIER
7 inputs including 2 tape decks allowing dubbing from one to another. 7 different gain attenuation levels plus master 32 stage level attenuator. Variable phono input sensitivity to match most cartridges.
Best ever KJ Price was £206.

INSTANT CREDIT – up to £500 possible. There's a budget account offering up to 20 times your selected monthly payment.

KJ Leisure Sound
AN AUDIBLE DIFFERENCE

- **CROYDON** 89 London Rd. Tel: 01-686 1343
- **HARROW** 340 Station Rd. Tel: 01-863 8690
- **LONDON, EC4** 53 Fleet St. Tel: 01-353 7935
- **LONDON, W1** 48 Wigmore St. Tel: 01-486 8263
- **UXBRIDGE** 278 High St. Tel: Uxbridge 33474
- **WATFORD** 101 St. Albans Rd. Tel: Watford 45250

BARCLAYCARD VISA
Use Access here

OPEN: MONDAY – SATURDAY 9.30 – 5.30 LATE NIGHT THURS (Wigmore St.) UNTIL 7 PM (FLEET ST CLOSED SATURDAYS)

Harrogate goes Hi Fi

ON AUGUST 16, 17, 18, 19th 1980

HARROGATE INTERNATIONAL FESTIVAL OF SOUND

Hi-Fi into the Eighties at the premier U.K. Hi-Fi Exhibition. Bigger and better than ever at the –

Exhibition Centre,
Royal Hall,
The Cairn, Crown,
Majestic, Old Swan,
Prospect, Hotels

All within a few minutes walk of each other. All the leading names in the world of sound, displays, demonstrations etc.

OPEN TO THE PUBLIC
Admission FREE
11am-8pm
Saturday 16 Aug.
Sunday 17 Aug.
TRADE TICKET ONLY
Monday 18 Aug. 10am-8pm
Tuesday 19 Aug. 10am-6pm

Exhibition & Conference Services Ltd., Claremont House, Victoria Avenue, Harrogate. Tel: 62677.

A-Z DISTRIBUTORS

GUARANTEED BARGAINS IN HI-FI, TV & VIDEO

We can beat any price on any Hi-fi

Please phone for best quotation on
JVC SONY AKAI MARANTZ
SANSUI PIONEER ETC.

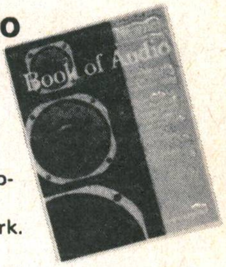
MAIL ORDER AND EXPORT FACILITIES AVAILABLE
Telephone: 01-603 7737 or 01-602 3856

A-Z DISTRIBUTORS

70 Shepherds Bush Rd., Shepherds Bush, London W6 7PH

Hi-Fi Books

Newnes Book of Audio
Donald Aldous, Dave Berriman, Clement Brown, Vivian Capel, John Gardner, Fred Judd and Gordon King
A comprehensive review of audio equipment and reproduction, with a clear description of how and why things work.
1979 144 pages £4.95



Master Books –
authoritative guides for your leisure all at £2.95

Master Creative Tape Recording
John Gardner
Master Electronics in Music
T.D. Towers
Master Hi-Fi Installation
Gordon J. King
Master Hi-Fi Loudspeakers and Enclosures Dave Berriman
Master In-Car Entertainment
Vivian Capel
Master Stereo Cassette Recording
I.R. Sinclair

Master Hi-Fi Installation
Master In-Car Entertainment
Master Hi-Fi Loudspeakers and Enclosures

Newnes Technical Books
Borough Green, Sevenoaks, Kent TN15 8PH

HERTS HI FI

Open a Credit Charge Account with Herts Hi Fi (Callers only)

Open 9.15-1. 2.00-5.30 Mon to Sat. Shut 1.00 Wed. Cheques with £50 cheque cards only accepted for counter sales with only one cheque per transaction. All prices include VAT at 15%. Cheques accepted for Mail Orders.
BARCLAYCARD, ACCESS CARD accepted for normal prices.
P.O.A. = Price on application. Sp.off = Special offer price for cash. P.P.T.B.A. = P & P to be advised.
All prices correct at time of preparation and subject to variations without notice. E & O E.
CREDIT FACILITIES AVAILABLE ON OUR DISCOUNT PRICES. MAIL ORDER SERVICE.

STOP PRESS Summer Sale Phone or call in immediately!

• RECORDERS (P/P £4.50)

Aiwa AD1250 (Sp. off.)	ON SALE
Aiwa AD2000 (Sp. off.)	£99.90
Aiwa AD6400 (Sp. off.)	£149.90
Aiwa AD6600 (Sp. off.)	£179.00
Aiwa AD6700 (Metal) + Remote	£269.00
Aiwa AD6800 (Sp. off.)	£199.90
Aiwa AD6900	£296.00
Aiwa AD69000 Mk2	£380.00
Aiwa ADM100 (Metal) (Sp. off.)	£78.00
Aiwa ADM200 (Sp. off.)	£114.00
Aiwa ADM600	£178.00
Akai CS703D	£87.50
Akai GX4000D (Black)	£189.00
Akai GXM30	£155.00
Akai GXM50	£222.00
Akai GXF80 (Metal)	£299.90
Akai GXF90 (Metal)	£355.90
Akai CS702D Mk 2 (Sp. off.)	£99.95
Akai GXC325D (Sp. off.)	£210.00
Akai GXC570D/2 (Sp. off.)	£480.00
Akai GXC725D	£235.00
Akai GXC730D (Sp. off.)	£220.00
Akai CS732D	£255.00
Akai GXC709D (Sp. off.)	£169.90
Akai GXC750D (Sp. off.)	£359.90
Akai GXC706D (Sp. off.)	£129.00
Akai GXC704D	£128.00
Akai GXC715D	£245.00
Akai GXC735D	£299.00
Hitachi D580	£157.00
Hitachi D850 (Sp. off.)	£171.50
Hitachi D900 (Sp. off.) 3-head	£210.00
Hitachi D30S	£94.00
Hitachi D40S (Sp. off.)	£98.00
Hitachi D55S (Sp. off.)	£111.00
Hitachi D75S	£158.00
Hitachi D77S (Sp. off.)	£149.00
Hitachi D230	£75.00
Hitachi D3300M	*P.O.A.*
Hitachi D980 (Sp. off.)	£168.00
Hitachi D5500A (Sp. off.)	£339.90
JVC KDA2, KDA5	*P.O.A.*
Marantz CD312 (Sp. off.) *plus* 3 TDK C90 Free	£75.00
Marantz CD330 Portable Dolby	£124.00
Marantz C205 Portable	£87.00
Marantz SD1000	£95.00
Marantz SD3000	£119.90
National Technics RS612US	£89.90
Pioneer CTF500	£84.50
Pioneer CTF600	£108.00
Pioneer CTF650 Metal	£160.00
Pioneer CTF750 Metal	£205.00
Pioneer CTF850 Metal	£224.00
Pioneer CTF950 Metal	£324.00
Pioneer CTF1250 Metal	£456.90
Sansui SC2000	£145.00
Sansui D90 S & B	£86.90
Sansui D100 Metal	£99.50
Sansui SC1300 (Silver)	£137.00
Sansui SC3300 (Silver)	£186.00
Sansui SC1330 Black	£137.00
Sansui SC3330 Black	£185.00
Sansui SG5100	£299.00
Teac A103 (Sp. off.)	£119.00
Teac A106, A107	£139.00
Teac A108S Simul. Sync	£165.00
Toshiba PCX10	£82.90
Toshiba PCX20	£129.90
Toshiba PCX40	£145.00

• RACKS, ACCESSORIES (P/P £1.25)

ADC SLM2 (P/P £2.50)	£41.00
ADC SS1 Sound shaper (P/P £3.00)	£61.00
ADC SS2 Mk. 2 (P/P £3.50)	ON SALE
ADC SS-3	ON SALE
ADC SS-110	£92.50
Aiwa CM2000A Stereo Mic	£23.50
Pioneer CB700	£49.90
Pioneer CB900	£63.00
Sansui GX60	£37.50
Sansui GX70	£45.00
Sansui AX7 Mixer	£157.50
Dumpamat (P/P £1.75)	£17.50

• KITS, LOUDSPEAKERS, DRIVE UNITS (P/P on application)

Celestion HF1300 6- and 15-ohm	£8.20
Celestion HF2000	£9.50
Coles 4001G	£6.50
KEF 104 AB Kit (add £5 P/P)	£125.00
KEF Cantata Kit (add £5 P/P)	£209.00
KEF B110 SP1003	£12.00
KEF B139 SP1044	£27.00
KEF B200 SP1014	£13.25
KEF DN12 SP1004	£8.65
KEF DN22 pair (104AB Crossover)	£40.85
KEF T27 SP1032	£9.45
Wharfedale Denton XP2 Kit	£29.90
Wharfedale Shelton XP2 Kit	£38.90
Wharfedale Linton XP2 Kit	£53.90
Wharfedale Glendale XP2 Kit	£65.90

• TUNERS (P/P £4.00)

Aiwa AT9300 LW (Sp. off.)	£73.00
Aiwa AT9700	£235.00
Akai AT2200 (Sp. off.)	£57.50
Akai AT2250L	£78.00
Akai AT2450L	£132.00
Harrison ST210 (Sp. off.)	£196.50
Hitachi FT4000	£85.00
Hitachi FT5000	£137.00
JVC JTV6	£99.00
Pioneer TX408L	£59.25
Pioneer TX608L	£89.50
Pioneer TX7800 Mk 2	£169.90
Pioneer TX8500 Mk 2	£225.00
Quad FM3	*P.O.A.*
Rogers T75 (Series 2) Teak/Wal	*P.O.A.*
Rotel RT426 (Sp. off.)	£79.90
Rotel RT226	£59.50
Rotel RT226L	£65.00
Rotel RT426L	£74.90
Rotel RT726	£99.90
Sansui T60	£68.90
Sansui T80	£98.90
Sansui TU217	£99.90
Sansui TU317	£110.00
Sansui TU417	£135.00
Sansui TU517	£181.00
Teac ATX30	£99.00
Toshiba ST220	£76.00
Toshiba ST420 (Sp. off.)	£99.90

• STEREO AMPLIFIERS (P/P £4.00)

Akai AM2600 (Sp. off.)	£199.00
Akai AM2250	£75.00
Akai AM2450	£129.50
Akai AM2350	£95.50
Aiwa AA8100 (Sp. off.)	£73.00
Aiwa AA8300	ON SALE
Aiwa AA8700	£260.00
Hitachi HA3300 (Sp. off.)	£79.90
Hitachi HA5300 (Sp. off.)	£119.90
Hitachi HMA7500 Mosfet	£356.00
Hitachi HA3500S Slimline	£87.00
Hitachi HA4500S Slimline	£109.00
Hitachi HA5700S Slimline	£163.00
Hitachi HCA7500	£224.00
Hitachi HA8300	£206.00
Hitachi HA5700S	£169.90
Hitachi HA7700 (Sp. off.)	£199.90
Hitachi HCA6500 & HMA6500 (Sp. off.)	£169.90
Marantz 1072 (Sp. off.)	£89.90
Marantz PM200	£75.90
Marantz PM250	£93.50
Marantz PM450	£128.00
Marantz M500	£137.50
Pioneer SA408	£59.50
Pioneer SA508	£88.90
Pioneer SA608	£124.90
Pioneer SA708	£164.90
Pioneer SA7800 Magniwide	£238.00
Pioneer SA8800 Magniwide	£279.00
Pioneer SA9800 Magniwide	£349.90
Quad 44, 33/303, 33/405	*P.O.A.*
Rogers A75 (Series 2) A100	*P.O.A.*
Rotel RA414 (Sp. off.)	£89.90
Rotel RA214 (Sp. off.)	£57.00
Rotel RA714	£119.90
Rotel RA413 (Sp. off.)	£79.90
Rotel RA314, RA350	£79.90
Rotel RA1000, RC1000, RB1000	£109.90
Sansui AU117 Mk. 1	£69.90
Sansui AU217 (Mk 2)	£105.00
Sansui AU417	£185.00
Sansui AU719	£278.00
Sansui AU317 (Mk 2)	£159.90
Sansui A40	£64.00
Sansui A60	£98.90
Sansui A80	£128.90
Teac ASM30	£90.00
Teac ASM50	£159.00
Toshiba SB620 (Sp. off.)	£159.90

• RECEIVERS (P/P £4.00)

Aiwa AX7300	£125.00
Aiwa AX7700	£159.90
Aiwa AX7800	£259.90
Akai AA1175 (Sp. off.)	£175.00
Akai AA1200 (Sp. off.)	£215.00
Akai AA1125 (Sp. off.)	£108.00
Akai AA1135 (Sp. off.)	£128.50
Akai AA1150 (Sp. off.)	£150.00
Audio-Pro 30 Gruppen (Sp.)	£399.90
Harman Kardon 330C	£95.00
Hitachi SR703 (Sp. off.)	£149.50
Hitachi SR903 (Sp. off.)	£199.00
Hitachi SR804	£219.00
Marantz 2226B (Sp. off.)	£169.90
Marantz 2216B (Sp. off.)	£119.90
Marantz 2238BL (Sp. off.)	£228.50
Marantz SR1000L	£124.90
Marantz SD1000	£88.00
Marantz SD4000	£189.90
Pioneer LX690	£165.90
Pioneer SX590	£99.50
Pioneer SX690	£128.50
Pioneer SX980	£397.90
Pioneer SX790	£202.90
Pioneer SX890	£254.00
Rotel 152/2 (Sp. off.)	£49.50
Rotel RX303 (Sp. off.)	£85.00
Rotel RX403L (Sp. off.)	£95.00
Rotel RX203L (Sp. off.)	£76.50
Rotel RX603 (Sp. off.)	£185.00
Sansui R30	£99.50
Sansui R50	£114.00
Sansui R70	£139.00
Teac AG5700 (Sp. off.)	£189.90
Toshiba SA420 (Sp. off.)	£112.00
Toshiba SA620 (Sp. off.)	£188.00

• STEREO SYSTEMS & PACKAGES (P/P on appl.) (Some exclude spkrs.)

Aiwa AA8700, AT9700, LP3000	£695.00
Aiwa Micro System A ex. Spkrs	£358.00
Aiwa Micro System B inc. Spkrs	£429.00
Aiwa Micro System C (inc. AP2100)	£465.00
Aiwa Micro System S (Sp. off.)	£299.00
Aiwa System 1 + spkrs (Sp. off.)	£335.00
Aiwa System 2 Rack + speakers	£399.90
Aiwa AF3060 ex. speakers (Sp. off.)	£210.00
Aiwa AF5300 + Speakers	£339.90
Akai AF5600 ex. speakers	£269.90
Aiwa AF3070 ex. speakers	£235.00
Aiwa AF3090 (Sp. off.) exc. spkrs.	£275.00
Akai Pro 100 inc. spkrs.	£449.00
Akai Pro 200 inc. spkrs.	£589.90
Akai AC3500 (Limited stock)	£279.00
Goodmans 4000 inc. M35 (Sp. off.)	£230.00
Hitachi SDT300*	£373.00
Hitachi SDT4001 Casseiver (Sp. off.)	£182.00
Hitachi SDT7820	£245.50
Hitachi SDT7840 (Sp. off.)	£231.00
Hitachi SDT7765 (Sp. off.)	£278.00
Hitachi SDT7785 (Sp. off.)	£352.50
Hitachi ACT 01 Mini System	£325.00
Marantz DC9/2L System	£395.00
Marantz 1515L Rack System	£374.90
Panasonic SG6070L (Sp. off.)	£599.00
Panasonic SG2080L (Sp. off.)	£299.90
Pioneer X33 exc. speakers	£299.00
Pioneer X55H exc. speakers	£429.00
Pioneer X55V exc. speakers	£445.00
Pioneer X77H exc. speakers	£485.00
Pioneer X77V exc. speakers	£499.00
Pioneer X99H exc. speakers	£618.90
Pioneer X99V exc. speakers	£629.90
Pioneer X99H/CTF600 (excl. spkrs.)	£549.00
Pioneer X99V/CTF600 (excl. spkrs.)	£565.00
Pioneer 424-2 (SX690)	£359.90
Pioneer Mini System 3000	£545.00
Rotel RX30 Rack (Sp. off.)	£340.00
Sansui G301 Rack System A	£399.00
Sansui GX60 System	£270.00
Sansui GX70 System	£320.00
Teac Libero 3000	£375.00
Teac Libero 5000	£480.00
Toshiba SM3350	£285.00
Toshiba SM3650	£389.00
Toshiba 220 Rack System (ex. spkrs)	£450.00
Toshiba 225 Rack System	£490.00
Toshiba 335 Rack System (ex. spkrs)	£485.00
Toshiba 445H System	£535.00
Toshiba SMD30 + Rack	£399.90

• LOUDSPEAKER SYSTEMS All prices per pair (P/P on application)

Bolivar 125 (Sp. off.)	£89.90
Castle Kendal Mk 2 (Teak)	£124.00
Castle Richmond	£84.50
Celestion 442	*P.O.A.*
Celestion 551	*P.O.A.*
Celestion 662	*P.O.A.*
Celestion Ditton 15XR	*P.O.A.*
Celestion Ditton 22	*P.O.A.*
Celestion Ditton 33	*P.O.A.*
Celestion Ditton 44	*P.O.A.*
Celestion County	*P.O.A.*
Celestion Ditton 120	*P.O.A.*
Celestion Ditton 121	*P.O.A.*
Celestion Ditton 332	*P.O.A.*
Celestion UL6	*P.O.A.*
Celestion UL8	*P.O.A.*
Chartwell LS3/5A, PM110, PM210	*P.O.A.*
Goodmans XB25	ON SALE
Goodmans XB35	ON SALE
Goodmans XB45	ON SALE
Goodmans RB18 (Sp. off.)	£47.50
Goodmans RB20	£73.50
Goodmans HE1	ON SALE
Goodmans HE2	ON SALE
Goodmans RB65 (Sp. off.)	£115.00
Goodmans Achromat Beta	ON SALE
Goodmans Achromat Kappa	ON SALE
Goodmans Achromat Sigma	ON SALE
Goodmans Mini 2	£53.50
JR149 (various finishes to order)	£129.90
KEF Cantata	£384.00
KEF Calinda	£218.00
KEF Corelli	£134.50
KEF Reference 101	£162.00
KEF Reference 104AB	£265.00
KEF Reference 105	£705.00
KEF Celeste III	£97.50
KEF Concorde 3	£165.00
KEF ULS1 & ULS2 Stands Pair	£18.50
Marantz 4G (Sp. off.)	£56.00
Marantz Avon	£47.50
Monitor Audio MA6	£130.00
Monitor MA2, MA6 improved, MA16, MA84 (all available in Teak/Walnut)	*P.O.A.*
Monitor Audio Mini Monitor	£79.90
Mordaunt Short Carnival	£89.90
Mordaunt Short Festival	£114.00
Mordaunt Short Pageant II	£172.00
Mordaunt Short Signifier Teak/Walnut	*P.O.A.*
Quad Electrostatic	*P.O.A.*
Rogers Export Monitor and Stands	*P.O.A.*
Spendor BC1 Mk 2, BC2, BC3	*P.O.A.*
Tangent Range	*P.O.A.*
Tannoy Range	ON SALE
Videotone Minimax 2	ON SALE
Videotone GB3	£57.50
Wharfedale E30	ON SALE
Wharfedale E50	ON SALE
Wharfedale E70	ON SALE
Wharfedale Chevin XP2	£34.00
Wharfedale Teesdale SP2 Teak	£137.00
Wharfedale Dovedale SP2 Teak	£184.00
Wharfedale Shelton XP2	£58.50
Wharfedale Linton XP2	£79.00
Wharfedale Glendale XP2	£103.90
Wharfedale Laser 200	£159.00
Wharfedale TSR Range	*P.O.A.*

• STEREO HEADPHONES (P/P £1.50)

Akai ASE7	£8.70
Akai ASE11	£12.75
Akai ASE22 + Volume control	£14.50
AKG K240 (Sp. off.)	£43.90
Beyer ET1000	£114.00
Beyer DT220	£24.50
Beyer DT440	£24.50
Beyer DT441	£31.00
Koss Range	ON SALE
Pioneer Monitor 10	£35.00
Pioneer SE205	£11.50
Pioneer SE305	£18.00
Sennheiser HD224X	£35.75
Sennheiser HD400	£11.75
Sennheiser HD414X	£19.00
Sennheiser HD424X	£26.50
Sennheiser HD420	£23.50
Sennheiser HD430	£30.50
Sennheiser Unipolar 2000	£99.90
Stax SR5/SRD6SB Electrostatic	£91.50
Stax SR44 Electret	£70.00
Stax SRX3/SRD6SB	£143.00
Stax Lamda	*P.O.A.*
Stax Sigma + SRD65B	£221.00
Wharfedale Isodynamic 2	£26.00

• TURNTABLES (P/P £3.50) AND ARMS (P/P £1.50)

ADC LMF1	£61.00
ADC LMF2	£67.50
ADC LMG-1 Headshell	£5.00
ADC ALT-1	£32.90
Garrard SP25 Mk 6 chassis	£29.50
Hadcock 'F' Arm & Unilift p/p free	£75.00
Hadcock GH228 and Unilift p/p free	£59.90
Micro Seiki MA303 Arm	£39.90
SME 3009 S/2 Det. Head	£59.90
SME 3009 Fixed Head	£55.50
SME Series 3	£96.50
SME Series 3S	£74.50
SME CA1 Series 3 Spare Arm/Shell	£16.25

• TURNTABLE PACKAGES (P/P on application)

ADC 1500FG & QLM34/3	£66.00
ADC 1600DD & QLM36/3	£85.00
ADC 17000D Quartz & XLM/3	£106.00
Aiwa AP2100	£59.50
Aiwa AP2300 and cartridge	£107.50
Aiwa AP2400 and cartridge	£113.50
Aiwa AP2600	£149.90
Aiwa AP3000 Linear Track (Sp. off.)	£345.00
Akai AP206 ex. Cart.	£95.00
Akai AP006 (Sp. off.)	£99.90
BSR BDS95 Module inc. Cart.	£44.00
Harman Kardon ST7 (Sp. off.)	£255.00
Hitachi PS48 Direct Drive (Sp. off.)	£89.90
Hitachi PS58 Direct Drive (Sp. off.)	£115.00
Hitachi HT324 (Sp. off.)	£49.90
Hitachi HT353 Quartz (Sp. off.)	£99.90
Hitachi HT550 Quartz (Sp. off.)	£89.90
Hitachi HT354	£79.00
Hitachi HT660 (Sp. off.)	£142.00
Marantz 6100W (Sp. off.)	£57.50
Marantz 6170	£92.00
Pioneer PL200 X + PC110/11	£95.00
Pioneer PL300 X + PC150	£102.00
Pioneer PL400 X + PC150	£127.90
Pioneer PL600 X	£199.90
Pioneer PL512	£48.90
Pioneer PLL1000	£369.00
Pioneer PL117D (Sp. off.)	£79.90
Rotel RP900 + QLM32 (Sp. off.)	£55.00
Sansui SRB200 + Cart	£57.50
Sansui SR222 Mk 2E Imp.	£66.50
Sansui FR1080P (Sp. off.)	£59.00
Sansui SR333E Direct Drive (Sp. off.)	£99.90
Sansui SR838E	£218.50
Sansui FRD3	£84.90
Sansui FRD4	£129.90
Sansui FRQ5	£147.50
Teac TSF15 + AT11	£66.00
Teac TSF30 + AT11	£78.00
Thorens 126 Mk. C	£265.00
Thorens TD160S exc. arm	£140.00
Thorens TD126 Mk. 3 BC/ Series 3S	£295.00
Thorens TD104	£86.90
Thorens TD105	£104.50
Thorens TD110 (Manual)	£110.00
Thorens TD115 (Automatic)	£144.00
Thorens TD160BC & 3009 Fixed	£157.50
Thorens TD126 Mk 3/C	ON SALE
Thorens TD160B C Mk 2	£89.90
Thorens TD160B C/SME 3009 Fitted	£149.90

• CARTRIDGES (P/P £1.50)

ADC XLM Mk 3 Improved	£36.00
ADC VLM Mk 3 Improved	£24.50
ADC ZLM Mk. 3 (Sp. off.)	£57.50
ADC XLM Super, Case & Shell	£33.75
ADC QLM 32/3	£8.90
ADC QLM 34/3	£9.90
ADC QLM 36/3	£15.90
AKG P6E	£17.50
AKG P7E	£26.00
AKG P8E	£39.50
AKG P8ES	£57.00
Empire 2000E IV	£13.90
Grado F3E+	£19.25
Grado FCE+1	£13.75
Grado F2E	£29.90
Grado F1+	£41.00
Goldring G9001GC	£49.00
Goldring G900E	£16.75
Goldring G800	£5.75
Goldring G800E	£9.50
Goldring G900SE Mk 2	£31.25
Ortofon FF10E (Sp. off.)	£8.90
Ortofon MC10 (Sp. off.)	£37.90
Ortofon F15E Mk 2	£22.00
Ortofon FF15E Mk 2 (Sp. off.)	£12.50
Ortofon M20E Super (Sp. off.)	£43.90
Ortofon M20FL Super (Sp. off.)	£51.00
Ortofon VMS20E/2 (Sp. off.)	£24.50
Ortofon MCA10	£54.00
Ortofon MC20	£57.00
Ortofon/SME 30H Cart/arm	£85.00
Satin M117G (Sp. off.)	£58.90
Satin M117Z	£38.90
Shure M44E	£7.90
Shure M55E	£8.90
Shure M75-6S	£7.90
Shure M75B Type 2	£10.75
Shure M75ED Type 2	£15.25
Shure M75EJ Type 2	£12.90
Shure M95ED	£19.90
Shure M95EJ	£13.90
Shure M95HE	£20.25
Shure M97ED	£29.90
Shure M97EJ	£22.50
Shure M97HE	£33.50
Shure V15 Type 3	£55.00
Shure V15 Type 4	£64.50
Shure V15 Type 3HE	£54.00
Shure M95HE	£25.00
Stanton 500E	£13.95
Stanton 500A	£11.75
Stanton 500EE	£15.20
Stanton 680EE	£23.95
Stanton 681EEE	£37.00
Stanton 881S	£59.95
Stanton 681EES	£52.00
Ultimo 20A	£75.50
Ultimo 10X	£49.50

166 St. ALBANS ROAD, WATFORD, WD2 4AS. Telephone: 40633

You get even more now at

WICKS

Why not visit our superb showrooms at 49/55, North Station Road, Colchester, Essex. Where you will find Hi-Fi Equipment on permanent demonstration and service second to none, plus of course, in keeping with the usual Wicks policy, some of the keenest prices in the country.

• MASSIVE RANGE ALWAYS IN STOCK • FULL AFTER SALES SERVICE • BIG DISCOUNTS • HELPFUL COURTEOUS SALES STAFF • ALL PRICES INCLUDE VAT

BIG SAVINGS

ENABLE YOU TO BUY EVEN BETTER HI-FI FOR YOUR MONEY

AMPLIFIERS

AKAI

AM2450	£129.95
AM2650	£195.00

AIWA

AA8700	£265.00

ARMSTRONG

621	£124.95

CAMBRIDGE

P.80	£219.00

HITACHI

HA2500	£79.00
HA3500	£89.95
HA4500	£109.90
HA7700	£235.00
HMA8300	£365.00
HCA8300	£165.00
HA5700	£165.00

MARANTZ

PM500	£159.90
PM700	£199.90
PM200	£79.90
PM250	£99.90
PM400	£129.90

NAD

3020	£86.00
3030	£99.90
3045	£145.00
3060	£199.00
3080	£239.00

PIONEER

SA408	£69.95
SA508	£89.95
SA608	£124.95
SA708	£165.00
SA7800	£240.00
SA8800	£279.00
SA9800	£350.00
SG9800	£240.00
SPEC 3	£165.00
SPEC 4	£385.00

ROTEL

RA300	£59.95
RA350	£84.90
RA214	£64.95
RA314	£79.95
RA414	£99.95
RA714	£129.90
RE700	£69.90
RB1000	£107.50
RC1000	£107.50
RA1000	£127.50

SANSUI

AUX1	£599.00
AU919	£438.00
AU719	£275.00
AU417	£199.95
AU317 mkII	£159.90
AU217 mkII	£107.00
BAF1	£349.00
CAF1	£259.00
A40 B/S	£68.90
A60 B/S	£98.90
A80 B/S	£129.90

SONY

TA313	£99.95
TA333	£96.90
TAF30	£99.90
TA535	£149.90
TAF40	£149.90
TAF3A	£124.00
TAF4A	£124.00
TAF5A	£170.00
TAF60	£189.00
TAF70	£299.95

TECHNICS

SU8022	£124.00

TRIO

MD600 Special Offer	£289.00

YAMAHA

CA810	£189.00
A1	£320.00
A450	£114.95
A550	£139.95

RECEIVERS

AIWA

AX7400	£159.95
AX7600	£210.00

ARMSTRONG

625	£189.00
626	£209.00

HITACHI

SR303L	£119.00
SR304L	£115.00
SR504L	£139.00
SR604	£169.00
SR804	£220.00
SR903	£250.00

MARANTZ

SR1000L	£129.90
SR2000L	£159.90
SR4000L	£219.90
SR6000	£299.90

PIONEER

SX590	£99.90
SX690	£129.90
SX890	£265.00
SX980	£389.00
SX1080	£450.00
SX1980	£699.00

ROTEL

RX300	£94.90
RX203	£94.90
RX203L	£104.00
RX303	£114.95
RX304	£114.95
RX404	£129.95
RX604	£180.00
RX504	£140.00
RX1000	£149.95

NAD

7030	£149.00
7045	£199.00
7060	£255.00
7080	£315.00

SANSUI

G5500	£185.00
R30	£98.95
R50	£115.50
R70	£153.50

SONY

STR232L	£119.90
STR333L	£149.95
STR434L	£249.00
STRV4L	£239.95

TECHNICS

SA100L	£124.00
SA200L	£159.95
SA300L	£215.00
SA400L	£242.00
SA500	£299.95
SA600	£349.00
SA700	£466.00

TANDBERG

TR2080	£450.00
TR2060L	£299.00
TR2045	£250.00

TRIO

KR2010L	£109.00
KR3010L	£149.00
KR4010	£189.00

YAMAHA

CR1020	£269.00

TUNERS

AIWA

AT9700	£229.90

ARMSTRONG

623	£135.00
624	£110.00

CAMBRIDGE

T55	£175.00

HITACHI

FT4000	£89.95

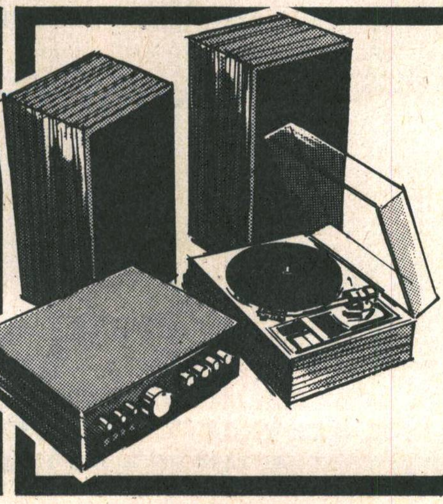
WHERE PEOPLE and PRICES MATTER!

When customers come to Wicks we like to think – in fact we know – that customers leave our shop more than satisfied with the service we give. Why? Well we are very selective in the staff we employ; they are all Hi-Fi enthusiasts eager to share their own experiences and give unbiased advice on Hi-Fi and audio reproduction and help in choosing just one piece of equipment or a complete stereo system with equal enthusiasm.

We offer the KEENEST PRICES AVAILABLE
Please ring us for details

If you don't see what you need in this advert. Please give us a ring.

This advertisement shows only a small selection from our vast stocks. If the equipment you require is not listed please telephone or write for details.



We are appointed agents for

○ ACOUSTIC RESEARCH ○ ACCUPHASE
○ AKAI ○ AIWA ○ AMSTRAD
○ ARMSTRONG ○ B.B.C. MONITOR
○ CAMBRIDGE ○ CELESTION ○ ERA
○ GARRARD ○ GOLDRING ○ GOODMANS
○ GRUNDIG ○ HARMEN KARDEN
○ HITACHI ○ J.B.L. ○ B.I.C. ○ KEF
○ KOSS ○ LEAK ○ MARANTZ
○ METROSOUND ○ NAD ○ NATIONAL PANASONIC ○ ORTFON ○ PIONEER
○ ROGERS ○ ROTEL ○ REVOX ○ SCAN DYNA ○ SANSUI ○ SHURE ○ S.M.E.
○ SANYO ○ TANDBERG ○ TEAC
○ TECHNICS ○ THORENS ○ TRIO
○ WHARFEDALE ○ YAMAHA

The best HI-FI & AUDIO - always at the best prices

'Some of the reasons for buying from WICKS'

DEMONSTRATIONS
Our staff have an intimate knowledge of all the Hi-Fi apparatus we stock and will provide a complete and leisurely demonstration in the relaxed atmosphere of our demonstration showrooms.

CREDIT FACILITIES
Make use of your ACCESS/ BARCLAYCARD. Give us your number by phone – do it before 12 noon and **we will guarantee same day despatch.**

PART EXCHANGE WELCOME
Anything considered. To personal callers only.

GUARANTEE Everything from Wicks is covered by the manufacturer's own guarantee – usually 1 or 3 years. During the guarantee period, we will service the equipment free of charge. If you return the goods via a carrier, you pay the forward carriage, we pay the return. From Wicks, there's a 99% chance of a 24-hour turnround service.

FT5000	£139.00
FT8000	£199.00

MARANTZ	
ST300L	£109.90
ST400L	£149.90

PIONEER	
TX408	£59.90
TX608L	£94.50
TX7800	£172.50
TX9800	£229.00

ROTEL	
RT300	£62.90
RT726	£99.95
RT1000	£104.90

SANSUI	
TUX1	£399.90
TU919	£279.90
TU719	£199.90
TU417	£134.90
TU317	£109.90
TU217	£99.50
T60 B/S	£69.00
T80 B/S	£104.90

SONY	
ST212L	£99.95
ST333L	£89.95
STA30L	£92.00
STJ60	£164.00

TECHNICS	
ST8011	£94.95
ST8055	£164.95

YAMAHA	
CT810	£159.90
T1	£220.00
T550	£114.95

TRIO	
LT413	£124.95

TURNTABLES

AIWA	
AP2200	£99.95
AP2400	£129.95
AP2600	£220.00
AP3000	£475.00

HITACHI	
HT324	£60.00
HT354	£89.00
HT356	£95.00
HT660	£175.00

JBE	P.O.A.

MARANTZ	
6025	£49.90
6170	£99.95

NAD	
5020	£74.95

PIONEER	
PL200	£89.00
PL300	£109.00
PL400	£128.00
PL600	£199.95
PL512	£49.95
PCL590	£299.95

ROTEL	
RP3300	£99.00
RP1000	£89.95

SANSUI	
FRQ5	£147.50
FRD4	£128.90
FRD3	£84.90
SR222 mkII	£59.90
FRD3 S/B	£84.90

SONY	
PS212A	£84.95
PST1	£79.95
PS333	£99.90
PSX40	£124.95
PSX35	£109.90
PSX70	£210.00
PST15	£84.95
RS8000/ TTS8000	£320.00

TECHNICS	
SLB2	£69.95
SLQ2	£124.95
SLD2	£89.95
SL1600	£219.90
SL1700	£199.00

TRIO	
KD1033 BC with Ortofon cart	£64.50
KD3100 inc. cart	£114.90

SPEAKERS

AR	
9	£550.00
18	£90.00
25	£129.00
90	£550.00
91	£425.00
92	£365.00

CELESTION	
121	£69.90
County	£89.90
15XR	£114.90
22	£159.90
25	£279.90
33	£199.90
44	£259.90
66	£449.90
332	£239.00
442	£299.00
551	£349.00
662	£495.00

GOODMANS	
RB25	£79.00
XB35	£110.00
XB45	£129.95

IMF	P.O.A.

JR	
JR150 (s/o).	£199.00

KEF	
104AB	£275.00
Calinda	£239.00
Celeste 3	£99.00
Concord	£179.00
Correlli	£139.00
105 mkII	£749.00

MARANTZ	
Avon	£49.95
5Mk.2	£145.00
HD440	£109.00
HD550	£220.00
HD660	£250.00
HD770	£350.00
4G3	£79.95

MONITOR AUDIO	
MA2	£325.00
MA4	£199.00
MA6	£165.00
MA9	£99.95
MA84	£275.00

PIONEER	
CS333	£59.95
HPM50X	£169.95
HPM70X	£220.00

SONY	
SSE20	£49.95
SSE30	£69.00
SSE50	£100.00

SPENDOR	
BCI	P.O.A.
BCII	P.O.A.
SAI	P.O.A.

WHARFEDALE	
Denton	£52.50
Shelton	£64.00
Linton	£77.90
Glendale	£109.95
E30	£199.00
E50	£290.00
E70	£350.00
Dovedale	£180.00

YAMAHA	
NS100M	£650.00

CASSETTE DECKS

AIWA	
AD2000	£144.95
AD6600	£239.95
AD6700	£325.00
ADM100	£99.00
ADM200	£124.95
ADL40	£219.00

AKAI	
GX725D	£235.00
GX730D	£229.00
GX750D	£359.00

HITACHI	
D30S	£95.00
D40S	£110.00
D75S	£159.00
D230	£85.95
D550	£119.00
D555	£114.00
D560	£140.00
D580	£179.00
D777	£195.00
D850	£189.00
D900	£240.00
D980	£265.00
D5500A	£410.00

MARANTZ	
SD1000	£99.90
SD3000	£129.90
SD4000	£219.90

NAD	
6020	£94.50

PIONEER	
CTF500	£88.90
CTF506	£94.95
CTF600	£109.90
CTF650	£172.90
CTF750	£214.50
CTF850	£225.00
CTF950	£325.00
CTF1000	£349.90
CTF1250	£425.00

ROTEL	
RD300	£79.90
RD1000	£169.90
RD15F	£99.00

SANSUI	
SC3330	£189.90
SC1330	£139.00
D90 B/S	£89.00

SONY	
TCU2	£89.95
TCU30	£119.95
TCU60	£189.00
TCK35	£119.95
TCK45	£149.00
TCK55	£175.00
TCK60	£240.00
TCK65	£229.00
TCK75	£269.00
TCK96R	£249.95
TCK7B	£319.00
EL5 Special Offer	£225.00

TECHNICS	
RS611	£88.00
RSM17	£119.95
RSM33	£145.00

TANDBERG	
TCD320	£299.00
TCD440A	£529.00

TAPE DECKS

AKAI	
1722	£240.00
GX4000D	£210.00
GX4000DB	£259.00
GX635D	£539.00
GX620D	£375.00

SONY	
TC399	£239.00
TC765	£475.00
TC766/2	£535.00
TC510/2	£410.00

HUER	
SG631	£499.00

TANDBERG	
TD20A 2 tr.	£599.00
TD20A 4 tr.	£550.00

CASSEIVERS

AIWA	
AF3070	£289.95
AF3090	£375.00

SONY	
HST49A	£199.00
HST89A	£249.00
HST99A	£350.00

TELEVISION

HITACHI	
CAP162	£250.00
CWP300	£235.00
P57	£199.95

PANASONIC	
TC2203	£350.00
TC481	£320.00
TR602	£89.95
TR5010	£145.00

SONY	
KV1400	£275.00
KV1820	£310.00
KV1822	£325.00
KV2200	£410.00
KV9000	£320.00
KV2022	£425.00

RADIO CASSETTE TELEVISION

HITACHI	
K62	£199.00
CKP100	£269.95

PANASONIC	
TR5001G	£210.00

MUSIC CENTRES & SYSTEMS

AIWA	
AF5600	£295.00
Micro system	£379.00

HITACHI	
SDT120/ ss6220	£199.95
SDT150/ ss6220	£220.00
SDT170/ ss8270	£275.00
SDT400/ ss8470	£350.00
SDT300/ ss8470	£349.00
SDT7785	£354.00
SDT2000/ ss8470	£359.00
Hitachi Micro System inc. Speakers	£319.00

PANASONIC	
SG3000/ SB500	£239.95
SG5000/ SB500	£395.00
SG5070/208	£379.95
SG5090	£429.00
SG6070	£599.00

SONY	
HMK11/ss33	£199.95
HMK33/ss33	£249.95
HMK7000	£410.00
HMK9000	£599.00

SYSTEMS

PIONEER	
3000 Mini syst.	£539.00
X33 system	£299.00
X55 system	£449.90
X77 system	£495.00
X99 system	£615.00

WICKS — THE HOME OF ALL THAT IS BEST IN HI-FI · AUDIO · ETC

DELIVERY BY SECURICOR
Order by post or telephone with confidence – you'll receive your order in 72 hours by Securicor. Please add £5 for delivery.

ORDERING BY POST Simply write telling us what you want enclosing cheque or Postal Order to cover cost plus £5 delivery charge by Securicor.

ORDERING BY TELEPHONE To reserve equipment in stock, just ring Colchester (0206) 78807 and we'll hold it for you for 48 hours giving you time to call personally or send your settlement by post.

'Such nice people'

WICKS

D. T. WICKS & CO., 49/55 NORTH STATION RD.,
COLCHESTER, ESSEX.
TELEPHONE: COLCHESTER (0206) 49842/3/4
After hours: Colchester 42166 Telephone Orders: Colchester 78807

SAVE TIME – USE THIS ORDER FORM

SEND TO: D. T. Wicks & Co. 49/55, North Station Road, Colchester, Essex. Telephone Colchester (0206) 49842/3/4

Please supply (give make and model number) ______________________

I enclose cheque/P.O. for £__________ made payable to D. T. Wicks & Co. or debit my Access/Barclaycard* account.

Number: ______________________
(delete as applicable*)

Signature ______________________

NAME: ______________________

ADDRESS: ______________________

PH 7

YOUR LOCAL HI-FI DEALER

LONDON AREA

Established 1910

H. L. SMITH & CO. LTD.

Comprehensive stock of equipment at competitive prices

National Panasonic and Technics

287–9 Edgware Road
London W2 1BE *Tel: 01-723 5891*

CHESHIRE

Lost in the Hi-Fi Jungle?

Phone WILMSLOW 526213
for an expert guide to the territories of:

A&R · Mission Electronic · OPTONICA · PIONEER · TRIO · Sansui

AIWA • ARISTON • AUDIOMASTER • B & W • DALESFORD • DUAL • GRADO • HARBETH • HITACHI • JVC • KEF • LINN • MITSUBISHI • NAGAOKA • ORTOFON • RAM • ROGERS • SALORA • STD • THORENS • ULTIMO • VIDEOTONE • WHARFEDALE •

SOUND ADVICE FROM EXPERT STAFF

MINIMUM OF 2 YEARS GUARANTEE ON ALL PRODUCTS (SERVICE DEPT. ON THE PREMISES)

OUR PRICES ARE USUALLY LOWER THAN THOSE QUOTED BY THE SO CALLED 'DISCOUNT WAREHOUSES'

SWIFT OF WILMSLOW
5, Swan Street,
Wilmslow, Cheshire.

CORNWALL

A Spray For All Reasons!

Q.E.D. AND ELECTROLUBE PRODUCTS AVAILABLE FROM:

HENNESSEYS HI-FI
25, TRINITY ST.,
ST. AUSTELL.
CORNWALL. Tel: 5088

DEVONSHIRE

GULLIFORD HOUSE LTD.

for

LINN, NAIM, MERIDIAN, NYTECH, ARC, REGA, A&R, EAR, HEYBROOK.

By appointment only.

**AT GULLIFORD HOUSE,
KENTON, EXETER, DEVON.
Tel.: DAWLISH (0626) 863604**

DEVONSHIRE (cont.)

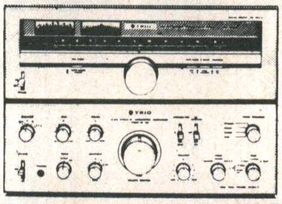
HI-FI
HOMESOUND
VIDEO

EXCLUSIVE SOUND DEMONSTRATION STUDIO

TRIO KD750 AND LO7 ON PERMANENT DEMONSTRATION. AKG, SENNHEISER, MONITOR AUDIO, MICRO-SEIKI, LUX, GRADO, ARISTON, TEAC, ROGERS, OPTONICA, IMF, HARBETH, NIGHTINGALE, MARANTZ, DENON, SANSUI, ORTOFON, PLUS OTHER LEADING MAKES.

4 YEAR GUARANTEE

KT615 TUNER AND KA601 AMPLIFIER



145, SIDWELL STREET, EXETER (0392) 72814

ESSEX

SERVICE in ESSEX

Agents for: Technics . Tandberg . Mission Electronics Sony . National Panasonic . Monitor Audio . Pioneer Bang & Olufsen . R Loudspeakers . Wharfedale . Audio Technica . Koss . Sanyo . Tannoy . Harman Kardon . Micro Seiki . Bollivar . Videotone . Ultimo Ortofon . Sennheiser

Video by: Philips . Sony . National Panasonic. Full range of Colour Televisions in stock from Battery Portables to 26 in. Cabinet Models, with built-in Teletex Decoders.

Home Demonstrations with pleasure.
Full range of Records and Tapes.

Kelleys Radio

BRENTWOOD	8 HIGH STREET. *Telephone: 215519*
CHELMSFORD	16-18 NEW LONDON RD. *Telephone 66764*
ROMFORD	8-9 SWAN WALK. *Telephone 41808*
SOUTHEND	92 HIGH STREET. *Telephone 63991*
LEIGH	1725 LONDON ROAD. *Telephone 78258*
HADLEIGH	265 LONDON ROAD. *Telephone 556815*
BASILDON	82 TOWN SQUARE. *Telephone 21638*
BRAINTREE	25 BANK STREET. *Telephone 25930*

Optimum Performance Every Time!

QED & ELECTROLUBE PRODUCTS
available from:

AUDIO TIMES

**35, HIGH RD.,
CHADWELL HEATH,
ESSEX**

GLOUCESTERSHIRE

Ray's

THE
HI-FI & MUSIC SHOP FOR GLOUCESTERSHIRE
DISCOUNT PRICES ON ALL EQUIPMENT.
AGENCIES INCLUDE: HITACHI, TECHNICS, AIWA, J.V.C., A.R., K.E.F., MORDAUNT SHORT, MARANTZ, SONY, QUAD, AKAI, ROTEL, TANNOY, TOSHIBA, TEAC, DUAL, MONITOR AUDIO, AUREX, TRIO, NAD, AUDIO MASTER, NAT-PAN, TDK, ETC.

**RAY ELECTRICAL LTD.
287 HIGH ST., CHELTENHAM.**
TEL: 22317

KENT

kent audio visual

Technics, Nat Pan, Hitachi, JVC, Trio, Grundig, Kef, Bose, Ortofon, Koss, Aiwa, AKG, Armstrong, Videotone, Hadcock, Toshiba, Tannoy, Thorens, Dual, Studiocraft, Teac, Akai.

RECORD DEPARTMENT—FULL SERVICE DEMONSTRATION FACILITIES

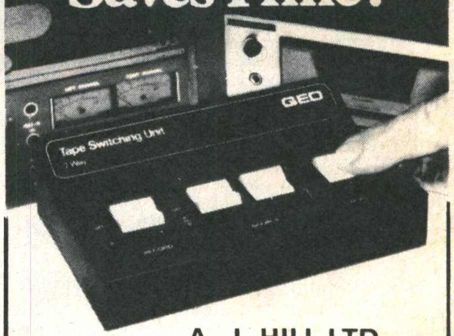
**33 Guildhall Street, Folkestone, Kent
Tel: 55881**

Photocraft Hi-Fi

LEADING AGENTS FOR:— A&R, Audio master, Bang & Olufsen "Black Tulip", B & W, Gale, Grace, Hadcock, Heybrook, Hitachi, JVC, KEF, Lentek, Linn Sondek, Meridian, Mission, Nytech, Nightingale, Profile, Quad, RAM, Rega, Revox, Spendor, Tangent, Teac, Toshiba, Trio, Yamaha.

**40, HIGH ST, ASHFORD, KENT
ASHFORD (0233) 24441**

A Switch-in Line Saves Time!



A. J. HILL LTD.

**6, STONE STREET,
GRAVESEND**

YOUR LOCAL HI-FI DEALER

LANCASHIRE

A Spray For All Reasons!

Q.E.D. AND ELECTROLUBE
PRODUCTS AVAILABLE
FROM:

FAIRS CAMERA SHOP
DACRE HILL ROCK FERRY,
BIRKENHEAD,
MERSEYSIDE

EAST MIDLANDS

NICK DAKIN

APPOINTED DEALERS FOR AIWA, JVC, LINN, NIGHTINGALE, MERIDIAN, QUAD, BOWERS and WILKINS, FERROGRAPH, IMF, SONY, DENON, DUAL

and many other leading makes.

WE WILL EQUAL ANY RETAILERS PRICE
DEMONSTRATIONS A PLEASURE

45 RADFORD ROAD NOTTINGHAM 783 862

WEST MIDLANDS

FIVE WAYS HIGH FIDELITY

AGENTS FOR:
ADC, A&R, ARISTON, AUDIOMASTER, B&W, BEYER, CELEF, DUAL, ENTRE, GARRARD, GRADO, HADCOCK, HARBETH, HEYBROOK, IMF, JBE, JR, KEF, LENTEK, MERIDIAN, MICHELL, MONITOR AUDIO, MORDAUNT-SHORT, ORTOFON, QUAD, RAM, REVOX, ROGERS, SMC, SME, SPENDOR, STD, TANGENT, THORENS, MOST JAPANESE BRANDS.

Demonstration facilities. Competitive prices.
9.30-6.00 Mon. to Sat. **021-455 0667**

12, ISLINGTON ROW, EDGEBASTON,
BIRMINGHAM, B15 1LD.

SCOTLAND

Russ Andrews
High Fidelity

34 Northumberland Street
Edinburgh 031 557 1672

The best people in Edinburgh for hi-fi

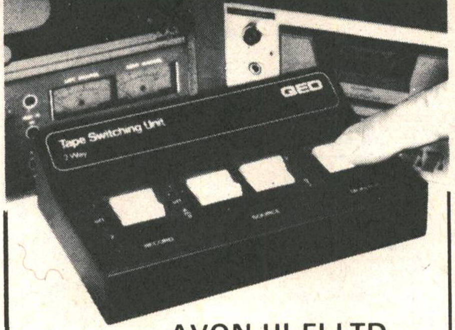
audio aids

Audio Consultants & Hi-Fi Specialists
52 George Street, Edinburgh
Tel: 031-226 3970 and 3979
and
43/45 South Clerk Street,
Edinburgh.
Tel: 667-2877

2 Year Guarantee

SHROPSHIRE

A Switch-in Line Saves Time!



AVON HI-FI LTD.

13, WYLE COP,
SHREWSBURY, SALOP.

STAFFORDSHIRE

SOUNDS

WOLVERHAMPTON'S MAIN AGENTS FOR — A.D.C., YAMAHA, KEF, AIWA, J.V.C., OPTONICA, J.R., CASTLE, PANASONIC, MARANTZ, AKAI, TECHNICS & SONY.

Call now for personal service and comparator demonstrations at —

Avion Shopping Centre,
Newhampton Road West,
Wolverhampton. Tel. 21126

Also stockists for
J.V.C. and Panasonic Video Recorders.

SURREY

WE MATCH PRICES

COSMIC RADIO

252 STATION ROAD, ADDLESTONE
WEYBRIDGE : SURREY

HARMAN KARDON, ORTOFON, JVC, JBL, TANNOY, SONY, TECHNICS, PANASONIC, SANYO, HITACHI, SHARP- OPTONICA.

WEYBRIDGE 54522

SUSSEX

A Switch-in Line Saves Time!

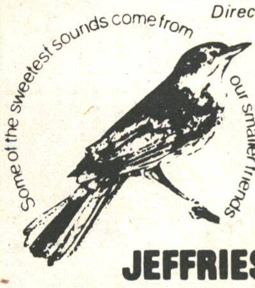
JEFFRIES RADIO VISION

4, ALBERT PARADE,
GREEN ST., EASTBOURNE

SUSSEX (cont.)

FOR SOUND QUALITY

Linn — Naim — Meridian — T.V.A. — Revox — Nytek — A&R — Nightingale — Dalquist — Neal — Ferrograph — Pioneer — Sansui — Monitor Audio — Celef — Chartwell — Tangent — Ram — Audiomaster — Sigma — Dual — Harbeth — Lentek — HK — Thorens — Entre — E.W.C. — Videotone — Optonica — Direct Cut Discs — etc.


Some of the sweetest sounds come from our smaller friends

Three years parts and labour guaranteed. Late night demos Wed. 6-9

JEFFRIES HI-FI
4 Albert Parade, Green Street
Eastbourne. Tel: (0323) 31336

Complete Audio Systems Ltd

THE MAIN AREA CENTRE FOR THE FOLLOWING:

MISSION, KEF, QUAD, B & W, SPENDOR, STD, HITACHI, ARISTON, TECHNICS, AIWA, CELESTION, DENON

- ★ *Super Demonstration facilities on 2 large floors*
- ★ *And the South East's Finest Classical Record Centre*

Vast stocks of accessories, tapes, etc
All servicing carried out by own specialist engineers

32 GROVE ROAD (Tel 0323 27362)
EASTBOURNE

PLEASE MENTION

PRACTICAL HI-FI

WHEN REPLYING TO ADVERTISEMENTS

SMALL ADS

The prepaid rate for classified advertisements is, Trade: 23 pence per word (minimum 15 words), Private: 12 pence per word (minimum 10 words), box number 60p extra, semi-display settings £4.30 per single column centimetre (minimum 2.5) cms). All cheques, postal orders, etc., to be made payable to Practical Hi-Fi and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance, should be sent to the Classified Advertisement Manager, Practical Hi-Fi, Room 2337, IPC Magazines Limited, King's Reach Tower, Stamford St., London, SE1 9LS. (Telephone 01-261 5785).

NOTICE TO READERS

Whilst prices of goods shown in classified advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

SELLING OR BUYING

A classified advertisement could solve your problem at very little cost

RING LINDA 01-261 5785

FOR SALE

DUAL CS506 Turntable, as new £75 ono. PIONEER PL112D Turntable, Shure M75ED and spare Headshell. Excellent condition £30. Genuine reason for sale — upgrading. Telephone West Malling 845813 Evenings and Weekends.

TECHNICS SL120 TURNTABLE, as new, with SME arm. Fixed ADC headshell. FD200 damper. Little used. Boxed. Phone Watton 882786. £130.

ORTOFON MC20 moving coil cartridge and MCA76 head amplifier £85. Unused. Selling due to hardship. 051-334 5093.

RECORDS

IRISH TRADITIONAL and Country Music. Send SAE for FREE catalogue and special offer prices. Bolton Wells Limited, 51 South End Road, London NW3 2OB.

ALBUM LIST 21. Hundreds in stock. Large SAE to JBT Records, (Hi-Fi), PO Box 32, Hull, HU4 6TY. (0482 54060).

BUSINESS OPPORTUNITIES

A LEADING EUROPEAN Hi-Fi Dealer is seeking an export arrangement with a dealer in the UK. Please write for further details to Box No. HF01.

AERIALS

SOUTH WEST AERIAL SYSTEMS

South West Aerials provide a comprehensive selection of both imported and U.K. aerial receiving equipment, for local, fringe, extra stations and DXing installations.
A customer advisory service is available to resolve reception problems *(send SAE please)*.

AXIOMATIC 18" Vertical whip antenna LW/MW/SW inclusive all fittings, transformers, cable and mounting hardware.	**£59.09**
TELDIS 26dB High gain very low noise FM masthead amplifier.	**£15.70**
Matching Power supply for above unit.	**£10.62**
JAYBEAM FM9S 'Super Fringe' 9 element FM Aerial.	**£39.26**
VORTA TS3 3 element FM Aerial, with Folded Dipole.	**£13.80**

All prices include VAT (15%) post & packing

Main Catalogue 24p. Additional lists available (1) Caravan Aerial equipment. (2) C.B. Aerials. But S.A.E. please. **30p stamps for complete lists.**

SOUTH WEST AERIAL SYSTEMS (PH)
10 Old Boundary Road, Shaftesbury, Dorset. Tel: 0747 4370

SPARES & REPAIRS

SONY, NAT PAN/TECHNICS, J.V.C., HITACHI, TOSHIBA, SANYO, ETC.
SERVICE MANUALS & SPARE PARTS BY POST
PHONE IN YOUR ORDER NOW
01-840 1890
HI-FI HOSPITAL (GRS) LTD.
100 UXBRIDGE ROAD, LONDON W7

HOME DEMONSTRATION

HOME DEMONSTRATIONS

GRAHAM NALTY
Derby's most helpful Hi-Fi Dealer
80 Curzon Street, Derby

Open 11am-6pm
Closed Wednesdays
Saturdays 10am-5pm
Telephone Derby 674929

MISCELLANEOUS

CROSSOVER
WITH
FALCON

Your guarantee of high quality Crossover Networks and Components, available direct or from your specialist supplier. We also stock most units by: KEF, SonAudax, Peerless, Coles, Celestion, Dalesford, etc. Send large S.A.E. (13½p stamp) for price list PL12 (Overseas $1 bill).

FALCON ELECTRONICS
Mail Orders and Callers:
Tabor House, Mulbarton, Norfolk NR14 8JT
Telephone: **0508-78272**

Due to the expiry of lease we regret that our retail shop at Bexhill will **CLOSE** on **FRIDAY, MARCH 21st.** In future all orders and enquiries should be addressed to **MULBARTON.**

SUGDEN, ORTOFON, QUAD, A.R., etc. Demonstrations service. Holdings, 39/41 Mincing Lane, Blackburn, BB2 2AF. Tel: 59595/6 (0254).

BUILD YOUR OWN P.A., GROUP & DISCO SPEAKERS by R. F. C. Stephens
Save money with this practical guide. Plans for 17 different designs, line source, I.B., Horn and Reflex types, for 8"-18" drive units. **£3.95** post free ($8 overseas).
THE INFRA-BASS LOUDSPEAKER by G. Holliman (full constructional details for versions using 15", 12" and 10" drive units.) **£2.95** post free ($6 overseas).
THE DALESFORD SPEAKER BOOK by R. F. C. Stephens. This book is a must for the keen home constructor. Latest technology DIY designs. Plans for I.B., and Reflex designs for 10-100 watts. Also unusual centre-bass system. **£2.20** post free ($5 overseas).
VAN KAREN PUBLISHING
5 SWAN STREET, WILMSLOW, CHESHIRE

ORDER FORM

PLEASE WRITE IN BLOCK CAPITALS
PLEASE INSERT THE ADVERTISEMENT BELOW IN THE NEXT AVAILABLE ISSUE OF 'PRACTICAL HI-FI'
FOR................ INSERTIONS. I ENCLOSE CHEQUE/P.O. FOR £.................
(CHEQUES AND POSTAL ORDERS SHOULD BE CROSSED LLOYDS BANK LTD. AND MADE PAYABLE TO PRACTICAL HI-FI

NAME...

ADDRESS ....

....

Send to:
CLASSIFIED ADVERTISEMENT MANAGER,
GMG ROOM 2337,
PRACTICAL HI-FI, IPC MAGAZINE LTD.,
KING'S REACH TOWER, STAMFORD STREET,
LONDON SE1 9LS.

RATES PRIVATE 12p per word. MINIMUM 10 WORDS
TRADE 23p PER WORD. MINIMUM 15 WORDS
BOX NO. 60p EXTRA

Company registered in England. Registered No. 53626. Registered Office: King's Reach Tower, Stamford Street, London SE1 9LS.

WILMSLOW AUDIO
The firm for Speakers

HI-FI DRIVE UNITS

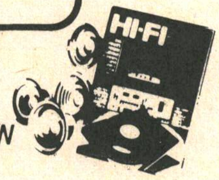
Audax HD12.9D25	£8.25
Audax HD11P25EBC	£7.50
Audax HD20B25H4	£14.95
Audax HD13D34H	£12.95
Audax HD24S45C	£21.95
Baker Superb	£25.00
Castle Super 8 RS/DD	£14.95
Chartwell CEA205 ...... pairs only	£61.25
Coles 4001	£7.65
Coles 3000	£7.65
Celestion HF1300 II	£10.95
Celestion HF2000	£10.95
Dalesford ABR 10"	£10.25
Dalesford D30/110	£11.25
Dalesford D50/153	£12.25
Dalesford D50/200	£12.25
Dalesford D70/250	£25.50
Dalesford D100/310	£35.75
Dalesford D10 Tweeter	£8.45
Decca London Horn	£61.95
Decca CO/1000/8	£10.25
Elac 6NC204 6½"	£7.50
Elac 8NC298 8"	£7.95
EMI 14A/770 14" x 9" 8ohm	£19.50
EMI Type 350 13"x8", 4ohm	£9.45
Isophon KK8/8	£8.15
Isophon KK10/8	£8.45
Jordan Watts Module	£24.95
Jordan Watts HF Kit	£10.50
Jordan 50mm unit	£24.50
Jordan CB crossover .... pair	£24.50
Jordan Mono Crossover .... pair	£24.50
KEF T27	£9.45
KEF B110	£12.25
KEF B200	£13.50
KEF B139	£27.75
KEF DN13	£6.75
KEF DN12	£9.40
KEF DN22 .... pair	£42.00
Lowther PM6	£59.00
Lowther PM6 MkI	£62.00
Lowther PM7	£94.50
Peerless KO10DT	£10.95
Peerless DT10HFC	£10.50
Peerless KO40MRF	£13.60
Radford BD25 III	£36.95
Radford MD9	£14.85
Radford MD6	£25.50
Radford FN8/FN831	£22.50
Richard Allan CG8T	£13.50
Richard Allan CG12T Super	£29.50
Richard Allan HP8B	£20.75
Richard Allan LP8B	£14.50
Richard Allan HP12B	£33.50
Richard Allan DT20	£9.95
Richard Allan DT30	£10.75
SEAS H107	£8.95
Shackman Electrostatic, c/w polar network and crossover .... pair	£130.00
Tannoy DC386 15"	£178.90
Tannoy DC296 10"	£107.35
Tannoy DC316 12"	£148.50
Tannoy DC386 15"	£178.90

ALL PRICES INCLUDE VAT at 15%

PA GROUP & DISCO UNITS

Celestion G12/50 TC	£19.50
Celestion G12/80 CE	£24.50
Celestion G12/80 TC	£23.75
Celestion G12/125 CE	£42.00
Celestion G15/100 CE	£37.95
Celestion G15/100 TC	£38.50
Celestion G18/200	£64.75
Celestion Powercell 12/150	£66.00
Celestion Powercell 15/250	£88.00
Celestion MH1000	£21.75
Celestion HF1300	£12.50
Celestion HF2000	£12.50
Fane Classic 45 12"	£13.95
Fane Classic 55 12"	£15.50
Fane Classic 80 12"	£19.75
Fane Classic 85 15"	£26.00
Fane Classic 150 15"	£37.95
Fane Classic 125 18"	£43.95
Fane Classic 175 18"	£47.95
Fane Guitar 80L 12"	£26.25
Fane Guitar 80B/2 12"	£27.25
Fane Disco 100 12"	£28.75
Fane PA85 12"	£26.25
Fane Bass 100 15"	£39.00
Fane Crescendo 12E	£57.50
Fane Crescendo 15E	£74.50
Fane Crescendo 18E	£94.75
Fane Colossus 15E	£99.95
Fane Colossus 18E	£107.00
Fane J44	£6.90
Fane J104	£15.95
Fane J73	£10.90
Fane HPX1/HPX2	£3.45
Fane HPX3A	£5.60
Fane HPX3B	£4.55
Goodmans 8PA	£5.05
Goodmans PP12	£22.50
Goodmans DJ12	£25.50
Goodmans GR12	£24.95
Goodmans 18P	£48.45
Goodmans Hifax 50HX	£21.85
McKenzie C1280GP	£24.45
McKenzie C1280TC	£24.45
McKenzie C1280 bass	£24.45
McKenzie GP15	£35.10
McKenzie TC15	£35.10
McKenzie C15 bass	£59.60
Motorola Piezo 3½"	£8.50
Motorola Piezo 2" x 6"	£12.25
Richard Allan HD8T	£20.25
Richard Allan HD10T	£21.75
Richard Allan HD12T	£29.75
Richard Allan HD15	£52.75
Richard Allan HD15P	£52.75
Richard Allan Atlas 15"	£77.00
Richard Allan Atlas 18"	£96.00

WILMSLOW AUDIO



KITS INCLUDE DRIVE UNITS, CROSSOVERS, BAF/LONG FIBRE WOOL, ETC. FOR A PAIR OF SPEAKERS.

Carriage £3.75, unless otherwise stated.

Practical Hi-Fi & Audio PRO9-TL (Rogers)	£146.00
As above, but including felt panels .... + £5 carriage	£152.75
Hi-Fi Answers Monitor (Rogers)	£146.00
Hi-Fi News State of the Art (Atkinson)	£185.00
Hi-Fi News Miniline (Atkinson) plus carriage £3.00	£49.00
Hi-Fi For Pleasure Compact Monitor (Colloms) plus carriage £5.00	£116.00
Popular Hi-Fi Mini Monitor (Colloms)	£74.00
Popular Hi-Fi Round Sound (Stephens) including complete cabinet kit	£71.00
Popular Hi-Fi (Jordan) plus carriage £3.00	£96.00
Practical Hi-Fi & Audio BSC3 (Rogers)	£65.00
Practical Hi-Fi & Audio Monitor (Giles)	£180.00
Practical Hi-Fi & Audio Triangle (Giles)	£120.00
Hi-Fi News Tabor (Jones) (with J4 bass units)	£66.00
Hi-Fi News Tabor (Jones) (with H4 bass units)	£70.00
Wireless World Transmission Line. KEF (Bailey)	£125.00
Wireless World Transmission Line (Bailey) Radford	£179.00
Everyday Electronics EE70 (Stephens) .... + £5 carriage	£150
Everyday Electronics EE20 (Stephens). plus carriage £3.00	£29.50

SMART BADGES FREE WITH ABOVE KITS (TO GIVE THAT PROFESSIONAL TOUCH TO YOUR DIY SPEAKERS!)

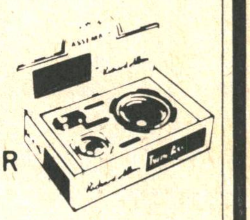
REPRINTS/CONSTRUCTION DETAILS OF ABOVE DESIGNS, 10p EACH.

CARRIAGE & INSURANCE

Tweeters & Crossovers	50p each
Speakers 4"-6½"	80p each
Speakers 8"-10"	£1.00 each
Speakers 12", 13" x 8", 14" x 9"	£1.95 each
Speakers 15"	£2.95 each
Speakers 18"	£4.50 each
Speaker Kits	£1.95 each, £3.95 pair
Mag. Design Kits	£3.75 pair

Prices correct at 1.3.80

SPEAKER KITS



PRICES PER PAIR CARRIAGE £3.95 PR.

Dalesford System 1	£54.00
Dalesford System 2	£57.00
Dalesford System 3	£104.00
Dalesford System 4	£110.00
Dalesford System 5	£142.00
Dalesford System 6	£95.00
Goodmans DIN20 4 ohm (Sp. off.)	£27.60
KEF Ref. 104aB kit ...... +£5 carr.	£133.00
KEF Cantata kit .... +£5 carr.	£213.50
LS3 Micro Monitor kit .... + £3.75 carr.	£71.00
Lowther PM6 Kit	£116.00
Lowther PM6 MkI Kit	£122.00
Lowther PM7 Kit	£195.00
Peerless 1070	£157.00
Peerless 1120	£169.90
Peerless 2050	£59.95
Peerless 2060	£79.95
Radford Studio 90 Kit	£181.00
Radford Monitor 180 Kit	£243.00
Radford Studio 270 Kit	£309.00
Radford Studio 360 Kit	£450.00
Ram Kit 50 (makes RAM 100)	£76.25
Richard Allan Tango Twin Kit	£55.50
Richard Allan Maramba Kit	£77.50
Richard Allan Charisma Kit	£111.00
Richard Allan Super Triple Kit	£102.50
Richard Allen Super Saraband II	£159.95
Richard Allan RA8 Kit	£62.75
Richard Allan RA82 Kit	£98.75
Richard Allan RA82L Kit	£108.00
Seas 223	£42.50
Seas 253	£67.00
Seas 403	£79.95
Seas 603	£134.95
Wharfedale Denton XP2 Kit	£31.45
Wharfedale Shelton XP2 Kit	£40.40
Wharfedale Linton XP2 Kit	£56.20
Wharfedale Glendale XP2 Kit	£69.00
Wilmslow Audio BA1 Sub Bass Amplifier/Crossover Kit .... + £1.00 carriage	£37.95

EVERYTHING IN STOCK FOR THE SPEAKER CONSTRUCTOR!

BAF, LONG FIBRE WOOL, FOAM, CROSSOVERS, FELT PANELS, COMPONENTS, ETC.

LARGE SELECTION OF GRILLE FABRICS

(Send 22p in stamps for grille fabric samples).

SWIFT
OF WILMSLOW
The firm for Hi-Fi
5 Swan Street,
Wilmslow, Cheshire.

Send 50p for 1980 56 page catalogue 'Choosing a Speaker'

Tel: Speakers, Mail Order and Export: 0625 529599
Hi-Fi (Swift of Wilmslow): 0625 526213

Lightning service on telephoned credit card orders!

WILMSLOW AUDIO
The firm for Speakers
Swan Works, Bank Square,
Wilmslow, Cheshire.

• All Prices inclusive of VAT at 15% • • Two Years Free Parts and Labour • • Excellent Demonstration Facilities •

RECEIVERS	
Technics SA200L	£128.00
Technics SA300L	£170.00
Technics SA400	£195.00
Akai AA1135	£125.00
Akai AA1125	£95.00
Aiwa AX7600	£159.00
Aiwa AX7800	£248.00
Pioneer SX590	£99.00
Pioneer SX690	£129.00
Beomaster 1500	£176.00
Beocentre 2800	£280.00
JVC JRS301	S.P. £135.00
JVC RS7	S.P. £249.00
JVC - Aiwa - Rotel	P.O.A.
Trio	P.O.A.
Technics New Range	P.O.A.
Sony	P.O.A.
Yamaha	P.O.A.
Bang & Olufsen	P.O.A.
Hitachi	P.O.A.

AMPLIFIERS	
Pioneer SA408	£59.00
Pioneer SA608	£127.00
Pioneer SA508	£91.00
Pioneer SA708	£165.00
Rotel RA300	£59.00
Technics SU8011	P.O.A.
Technics SU8022	P.O.A.
Technics SU8044	P.O.A.
JVC AS5	£85.00
JVC JAS22	S.P. £106.00
Quad	P.O.A.
Hitachi	P.O.A.
Yamaha	P.O.A.
Technics New Range	P.O.A.
Sony	P.O.A.
JVC	P.O.A.
Revox	P.O.A.
Sugden	P.O.A.
JVC	P.O.A.

TUNERS	
Pioneer TX408	£59 00
Pioneer TX608	£94.00
Technics ST8011L	£98.00
Technics ST8044L	P.O.A.
Technics ST8055	P.O.A.
JVC TV5L	£97.00
Quad	P.O.A.
Trio	P.O.A.
Sony	P.O.A.
Yamaha	P.O.A.
Technics New Range	P.O.A.
Hitachi	P.O.A.
JVC	P.O.A.
Sugden	P.O.A.
Revox	P.O.A.

CASSETTE/TAPE	
Pioneer CTF500	£88.00
Pioneer CTF600	£109.00
Pioneer CTF650	£170.00
Beocord 5000	£299.00
Aiwa M100	Low price
Aiwa ADL40	£145.00
Aiwa 6600	£165.00
Aiwa New Range	P.O.A.
Akai GX4000D	£207.00
Akai GX4000DB	£240.00
JVC New Range	P.O.A.
JVC KDA3	£139.00
JVC KDA5	£199.00
JVC KD720	£89.00
Hitachi DT555	£129.95
Aiwa New Range	P.O.A.
Sony Range	P.O.A.
Hitachi New Range	P.O.A.
Technics New Range	P.O.A.
Bang & Olufsen	P.O.A.
Revox	P.O.A.

TURNTABLES/CARTRIDGES	
Technics SLB2 c/w cart.	P.O.A.
Technics SLD2 c/w cart.	P.O.A.
Technics SLQ2 c/w cart.	P.O.A.
JVC QLA5R	P.O.A.
Pioneer PL512	£49.90
Pioneer PL200X	£89.00
Pioneer PL300X	£109.00
Pioneer PL400X	£129.00
Dual CS506 c/w cart.	P.O.A.
Dual CS606 c/w cart.	P.O.A.
Dual CS714Q c/w cart	P.O.A.
Dual CS731Q c/w cart	P.O.A.
Technics Range	P.O.A.
Bang & Olufsen	P.O.A.
Sony, Yamaha, JVC, ADC,	P.O.A.
Thorens, Shure, Ultimo, Ortofon	P.O.A.
Revox, Entre, etc.	P.O.A.
SME 3009ND Arm	£59.00
SME 3009III Arm	£109.00

HI-FI RACKING SYSTEMS from	
Sony, Rotel, Technics, National, JVC, Pioneer	P.O.A.

SPEAKERS (pair)	
Goodmans XB25	£89.00
Goodmans XE35	£109.00
Goodmans XE45	£128.00
Wharfedale Shelton	£64.00
Wharfedale Linton XP2	P.O.A.
Wharfedale Teesdale SP2	P.O.A.
Wharfedale E30	P.O.A.
Wharfedale E50	Low price
Wharfedale E70	Low price
Celestion Ditton 15XR	£115.00
Celestion Ditton 22	P.O.A.
Celestion Ditton 33	P.O.A.
Celestion 442	P.O.A.
Celestion 551	P.O.A.
Celestion UL8	£155.00
B&W Range	P.O.A.
Monitor Audio - IMF	P.O.A.
Castle — AR - JR	P.O.A.
Mordaunt Short	P.O.A.
Spendor — Quad	P.O.A.
Bang and Olufsen	P.O.A.
Tangent	P.O.A.
Mission	P.O.A.
Lentek	P.O.A.
Audiomaster	P.O.A.

CASSETTES (Price each)	5 Rate	10 Rate
BASF LH C90	83p	82p
BASF Super C90	£1.37	£1.34
TDK AD C90	£1.22	£1.14
TDK SA C90	£1.65	£1.54
Maxell UD C90	£1.36	£1.33
BASF FSLH1 C90	£1.33	£1.30
Fuji		P.O.A.
Sony		P.O.A.

POSTAGE 75p PER TEN; 98p PER 20

S.A.E. FOR CASSETTE AND TAPE PRICES

PRICES CORRECT AT TIME OF GOING TO PRESS

GIVE US A RING IN CASE THEY'RE EVEN CHEAPER

monitor sound TEL 71935

64 chapel st.
chorley, lancashire.

ADVERTISERS' INDEX

Acoustical Mfg. (Quad) 34
Acoustic Research 15
A&R (Cambridge) 78
Audio Electronics 98
Audio Pro 84, 88
Audio Services 22
A-Z Distributors 112

Bartletts Hi-Fi 2, 3
Boots Co. 5
Brady, W. A. & Sons 22
Butterworth & Co 112

Chew & Osborne 92
Comet 102-107
Complete Audio Systems 26
Coppins 98

Darby's 108
Denon 23

Estuary Audio 76
Exhibition & Conference Services Ltd 112
Fotronix 99

Grado Cartridges 100, 101
Griffin 6
Grundig 32, 33

Hayden Labs 18
Herts Hi-Fi 113
Honland-West 89

I.M.F. Electronics 47

J.V.C. 10, 16, 17

K. J. Leisuresound 94, 111

Laskys 11-14
Lentek 77

Mayware Ltd 7
Mission Electronics Cov II
Monitor Audio Cov III
Monitor Sound 120
Motion Electronics 39

Naim Audio 4
Natural Sound Systems 82, 83

O'Brien 110
Ortofon 25

Planet Hi-Fi 109
Pye 31

QED Audio Products 5
Quadraphenia 24

Rayleigh Hi-Fi 29
Reading Cassettes & Hi-Fi Centre 28
Revox 67
Rola Celestion Ltd 48

Scarfe Audio Visual 7
Shure Electronics 30
SM Electronics 37
Spaldings 54
Subjective Audio 88, 108

Tandberg 20
Tandy 95-97
Teac 8, 9
Technics Cov IV
Top Tape 27

Vennal Audio 84
Videotone 84

Wicks, D. T. 114, 115
Wilmslow Audio 119

Your Local Hi-Fi Dealers 116, 117

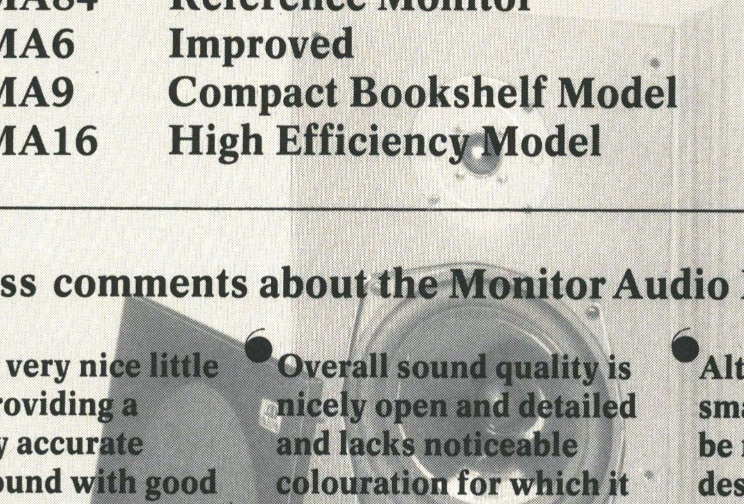
Published approximately on the 20th of each month by IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE19LS, telephone 01-261 5000. Monotone and colour origination by G.M. Litho, Princes Risborough. Printed in England by Plymouth Web Offset, Plymouth. Distributed by IPC Business Press (Sales and Distribution) Ltd., 40 Bowling Green Lane, London EC1R 0NE. Sole Agents: Australia and New Zealand, Gordon & Gotch (A/sia) Ltd.; South Africa, Central News Agency Ltd. Subscriptions: Inland £9.50, Overseas £10.50 per annum payable to IPC Services, Oakfield House, Perrymount Road, Haywards Heath, Sussex. PRACTICAL HI-FI is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first given, be lent, resold, hired out or otherwise disposed of by way of trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to VAT, and that it shall not be lent, resold or hired out or otherwise disposed of in a mutilated condition or any unauthorised cover by way of trade or affixed to as part of any publication or advertising, literary or pictorial matter whatsoever.

Buying Monitor Audio is your guarantee...

...of quality, reliability and outstanding value for money

'Monitor Series 80'

MA2	Domestic Reference	120 watts
MA84	Reference Monitor	100 watts
MA6	Improved	80 watts
MA9	Compact Bookshelf Model	60 watts
MA16	High Efficiency Model	40 watts



Some press comments about the Monitor Audio MA9

'All in all a very nice little speaker providing a reasonably accurate detailed sound with good imaging properties, high standards of construction and a smart appearance, which is an important factor when Hi-Fi equipment is in the living-room . . .'

Hi-Fi Answers *February*

'Overall sound quality is nicely open and detailed and lacks noticeable colouration for which it scores good marks. Large scale choral works come across in a very satisfying manner, as did most other types of music.'

Practical Hi-Fi *March 1980*

'Although the MA9 is the smallest speaker, it must be regarded as the best design. Unless you're interested in impressing people with big boxes, the MA9 is also the best buy.'

What Hi-Fi *April 1980*

Listen to the new 'Monitor Series 80' range at your nearest Monitor Audio stockist.

Monitor Audio Ltd

347Z Cherry Hinton Road Cambridge England
Telephone (0223) 46344 & 42898
Telex 817343 Blue CAM/G

Please send me further information about 'Monitor Series 80'

Name ____________

Address ____________

Make no mistake, you're looking at the biggest advance in speaker technology since hi-fi began.

If you think that sounds more like sci-fi, allow us to explain.

Up until now, speaker systems have been built around the limitations of hollow cone-shaped drivers.

And, no matter how ingenious they've been, designers have always run up against the same paradox: how to build a drive unit of high rigidity and yet low mass.

Small wonder that speakers have remained the weakest link in the hi-fi chain.

So at Technics, along with a few other enterprising manufacturers, we decided to take the radical step of replacing the cone with a flat diaphragm.

To do this, we needed a structure of extraordinary lightness and rigidity.

Hence, the honeycomb.

Originally developed by the aircraft industry, it proved to have a bending strength of up to 1500 times higher than paper and 700 times higher than aluminium.

Then, being Technics, we went one step further.

By using something called 'axial symmetry,' our engineers were able to make the honeycomb structure round.

Which in turn meant we could effectively overcome vibration problems.

And thus satisfy our own standards of wave form fidelity and phase linearity.

What all this adds up to in sound reproduction is something quite remarkable.

Lower inherent distortion.

Smoother, flatter frequency response.

A previously unheard-of frequency range.

As you might expect, there's a price to pay for such a technological advance.

The fact is, a pair of SB10 or SB7 Honeycomb Disc Speakers will set you back around £666 and £400 respectively.

But look at it this way. It's a small price to pay for a piece of hi-fi history.

Technics

107/109 Whitby Rd, Slough, Berks SL1 3DR.

All prices inclusive of VAT and correct at time of going to press.

The SB10 Honeycomb Disc Speaker System.
Technics
After 50 years of the hollow cone, Technics introduce the Honeycomb.